UNIVERSITI TEKNIKAL MALAYSIA MELAKA

Faculty of Electrical and Electronic Engineering Technology

DEVELOPMENT OF A DROWSINESS WARNING SYSTEM WITH AN ALCOHOL DETECTOR USING RASPBERRY PI.

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Bachelor of Computer Engineering Technology (Computer System) with Honours

2023

DECLARATION

I declare that this project report entitled “Development Of A Drowsiness Warning System With An Alcohol Detector Using Raspberry Pi” is the result of my own research except as cited in the references.

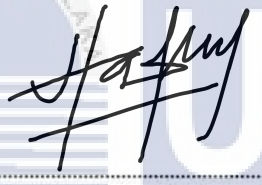
Signature : 

Student Name : MATTHEW TIMA ENSIRIBAN

Date : 27 Januari 2023

APPROVAL

I hereby declare that I have checked this project report and in my opinion, this project report is adequate in terms of scope and quality for the award of the degree of Bachelor of ComputerEngineering Technology (Computer System) with Honours.

Signature : 

Supervisor Name : Ts. Dr. Hasrul 'Nisham Bin Rosly

Date : 27 Januari 2023

DEDICATION

Every difficult task requires both self-effort and the wisdom of elders,especially those who were extremely dear to us

My humble effort I dedicated to my loving

Father,Mother & Family,

who's care, love, support, and day and night prayers give me courage and motivation to be able to achieve such achievement and honour,

Along with all hardworking and respected

Lectures

ACKNOWLEDGEMENTS

First and foremost, I was happy with myself for finishing this project. Thank you so much to my father, Ensiriban Anak Enteba and my mother, Demai@Lani Binti Dingun for everything and from the start till this this was finished, I could always count on their support and prayers.

I would like to convey my sincere gratitude to my dear supervisor, Ts. Dr. Harsul 'Nisham bin Rosly, for all of his support and assistance with my project, Development Of A Drowsiness Warning System With An Alcohol Detector Using Raspberry Pi, which is a component of my Final Year Project (FYP). He also shared all of his professional insights and experiences with me, as well as the finest advice for me to finish my project on time.

I want to express my gratitude to the members of my panel, Ts. Niza Binti Mohd Idris and Mr. Noor Mohd Ariff Bin Brahin, for all of their suggestions and guidance on how to make this project better. I want to thank all of my classmates for being so encouraging and kind during the semester.

ABSTRACT

In this era of globalization, technology has become part of our daily life. With technology's help, many problems able to be solved and makes human life easier. Globally, there are many deaths are increasing day by day due to road accidents and the factor causing this death are drivers drunk or sleepy during driving. When the driver drives while sleepy or in a drunk state, it is very dangerous and able to lead other vehicle crashes and affect other people's safety. These are the problem that will occur when the driver actually does not alert due to, they are sleepy or in a drunk state. Due to this situation and it needs an alerting system to remind the driver of the safety of the driver. Therefore, the purpose of the project is to develop a drowsiness warning system with an alcohol detector in the vehicle. The objective of this project is to develop a warning system for sleepy driver or alcohol presence from the driver and use the raspberry pi as the main component, to give alerting sound to drivers using a buzzer and USB camera that is able to observe the driver's eye. This drowsiness and alcohol alerting system used Raspberry Pi as the main component to control the input and output of the system which consists of image processing to detect the driver's eye. An alcohol sensor is used to detect the driver's alcohol presence from the driver and the buzzer will produces a sound to alert the driver if the alcohol is presence. This project is user-friendly as it is able to improve the safety of the driver before they drive their vehicle.

ABSTRAK

Dalam era globalisasi ini, teknologi telah menjadi sebahagian daripada kehidupan seharian kita. Dengan bantuan teknologi, banyak masalah dapat diselesaikan dan memudahkan kehidupan manusia. Secara global, terdapat banyak kematian semakin meningkat dari hari ke hari akibat kemalangan jalan raya dan faktor penyebab kematian ini ialah pemandu mabuk atau mengantuk semasa memandu. Apabila pemandu memandu dalam keadaan mengantuk atau dalam keadaan mabuk, ia amat berbahaya dan boleh menyebabkan kenderaan lain merempuh dan menjejaskan keselamatan orang lain. Inilah masalah yang akan berlaku apabila pemandu sebenarnya tidak berjaga-jaga disebabkan pemandu tersebut mengantuk atau dalam keadaan mabuk. Disebabkan keadaan ini dan ia memerlukan sistem amaran untuk mengingatkan pemandu tentang keselamatan pemandu. Oleh itu, tujuan projek ini adalah untuk membangunkan sistem amaran mengantuk dengan pengesan alkohol di dalam kenderaan. Objektif projek ini adalah untuk membangunkan sistem amaran untuk pemandu yang mengantuk atau kehadiran alcohol dari pemandu dan menggunakan raspberry pi sebagai komponen utama, untuk memberikan bunyi peringatan kepada pemandu menggunakan buzzer dan kamera USB yang mampu memerhati mata pemandu. Sistem amaran mengantuk dan alkohol ini menggunakan Raspberry Pi sebagai komponen utama untuk mengawal input dan output sistem yang terdiri daripada pemprosesan imej untuk mengesan mata pemandu. Sensor alkohol digunakan untuk mengesan kehadiran alkohol pemandu di dalam kereta dan buzzer akan mengeluarkan bunyi untuk memberi amaran kepada pemandu jika terdapat kehadiran alkohol. Projek ini mesra pengguna kerana ia mampu meningkatkan keselamatan pemandu sebelum mereka memandu kenderaan mereka.

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CHAPTER 1

INTRODUCTION

This chapter demonstrates the background of the project, problem statement, objectives, scope of the project, and the project outline.

1.1 RESEARCH BACKGROUND

This technology was created to detect the presence of alcohol from the driver before that person drives their vehicle. The technology helps to prevent accidents caused by intoxicated driving. The proposed system is going to identify whether the person is in a drunken state or not and it will give a warning sound to the driver. This can be done using the Raspberry PI board. "Alcohol and sleepiness detection" is the major goal of this study. Several accidents are occurring in the present environment as a result of alcohol intake or the person feeling sleepy while steering the vehicle.

The attitude of the driver is very important to ensure the safety of the road. Feeling sleepy and alcohol an emotional state will affect the driver's performance [4]. All these distractions will make them lose control of their vehicle which will lead to traffic accidents. Drowsiness is a significant factor in traffic crashes. Driving in a drunk state will increase the road traffic crash and caused death or serious injury to themselves or the surrounding people.

As a result, intoxication and drowsiness may be a major cause of accidents all over the world. We are proposing this alcohol detection system and drowsiness in vehicles to prevent vehicle accidents due to sleepy and drunk. The MQ5 Alcohol Detection sensor can be applied in all vehicles to detect whether the driver has consumed alcohol, and an alert sound will be triggered to warn the driver itself if the person is in a drunken state or the person feeling sleepy before they can drive their vehicle. This is a good way to detect alcohol consumers and sleepy people to minimize vehicle accidents occur.

1.2 PROBLEM STATEMENT

Nowadays, drowsiness and drunken driving are factors that cause car accidents globally and are always highlighted news. The percentage of these accident cases continues to increase from year to year. Driving in a drunken drowsy state is a major transportation safety concern and is responsible for thousands of accidents [3]. Drowsy and drunk driving accidents will usually result in the driver's loss of control, often leading to unpredictable vehicle trajectories and no braking response [4]. The main problem is the driver needs to be aware and conscious before they need to drive. So, this product will help the driver to make the driver alert and ensure safety of the driver before they can drive their vehicle. With this drunk and drowsiness warning system, the driver is able to be more cautious when they had drunk some alcohol or if they are feeling sleepy before they are driving. Predicting the driver's behavior and their next move is the crucial part [4]. The systems will help to increase the alert and safety of drivers and they're conscious when in the vehicle bad driving behavior will lead to road accidents occur and a warning system to alert the driver's attention to make the driver realize of driving their vehicle is an evolving area of research.

1.3 OBJECTIVE

In order to complete this project, there are several objectives that needed to be achieved in order to determine the success of the project. The main objective of this project is to design a drowsiness warning system with an alcohol detector. The objectives are as stated as follows:

a) To identify the optimal settings on the Raspberry Pi that involve sensor connections.
b) To analyse the effectiveness of the warning system to warn the driver.
c) To develop a prototype drowsiness warning system based on eye and alcohol detection.

1.4 SCOPE OF RESEARCH

This project focuses on designing a product that is able to conduct an analysis of vehicle accidents and the efficiency of this warning system to warn the driver.

The scope of this project is as follows:

a) Construct a circuit consisting of Raspberry PI that involves image processing and sensors that able to sense alcohol presence.
b) The alcohol presence and counts of eyes open from each frame will be recorded in a table.
c) The open eye's algorithm will be used in OpenCV which is using Python as a programming language.
d) This warning system can only operate when the person is feeling sleepy, or the alcohol is presence when the sensor is activated.

CHAPTER 2

LITERATURE REVIEW

2.1 Introduction

This chapter discusses the important details from previous research and several studies. Thus, the discussion begins with the study of drunk and drowsiness detector concepts. The research of these concepts is important as it is the main objective of this project. This project involves the Raspberry Pi technology, so it is crucial to study the concept of how using it and how it is work. For the summary, the chapter ends with a comparison of the related existing projects and the implementation that fits this project.

2.2 Concept of drowsiness and drunk warning system.

In general, the warning system is a system deployed by a person or a group of people to give information about a future danger [6]. The main purpose of the warning system is to make preparation and give responses so that able to avoid it. The warning system will be effective if people react to it. This warning system is applied to drowsiness and drunk in the vehicle, which will be alerting the driver to avoid driving the car if they are in a drunk and sleepy state [8]. It will be a useful device for the driver to remind them not to drive if they feel sleepy or drunk. It is much easier if we create a flexible device to detect these symptoms and are able to perform alerting system to the driver. Figure 2.1 illustrate a system consists image processing which will act as input to observe whether a person is sleepy before the drive, and give a warning to the driver rapidly and effectively.

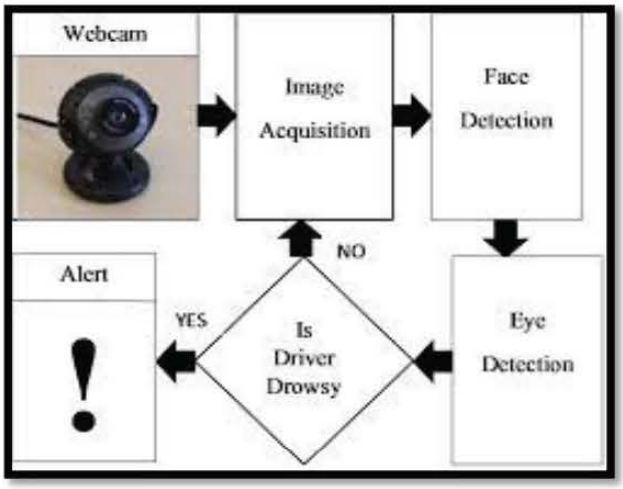

Figure 2.1: Example of Drowsiness Warning System

2.3 Concept of Alcohol Detector

One of the famous alcohol sensors that is commonly used is MQ5. This sensor is a type of Metal Oxide Semiconductor (MOS). It is also called Metal oxide sensors also known as Chemiresistors. It is able to sense the changes of resistance of the sensing material when it is exposed to alcohol [13]. Placing MQ5 in a simple voltage divider network, it is able to detect alcohol concentrations.MQ5 is a heater-driven sensor so it is why it needs to be enclosed in two layers of fine stainless-steel mesh which is known as an Anti-explosion network [13]. It is because the heater element in the sensor will not cause an explosion since the alcohol is a flammable gas [3]. It has protection for the sensor and filters out unwanted particles so it only allows gaseous elements to go through inside the chamber.

Figure 2.2: Example of Alcohol Sensor

Figure 2.2 shows the example of alcohol sensor which has a SnO2 (Tin Oxide) semiconductor layer. As a result, oxygen is adsorbed on the surface of the SnO2 semiconductor layer when it is heated to a high temperature. In clean air, electrons from tin dioxide's conduction band are drawn to oxygen molecules [13]. This produces a potential barrier by forming an electron depletion layer just below the surface of SnO2 particles. As a result, the SnO2 layer becomes highly resistive, preventing the flow of electric current [13]. Figure 2.3 shows the specification for MQ5 sensor and its behavior. MQ5 sensor used voltage between 4.9V and 5.1V which able to detect alcohol presence between 200 ppm until 10000 (Part Per Million).

Specifications of MQ-5 Gas Sensor :

Item	Parameter	Min	Typical	Max	Unit
VCC	Working Voltage	4.9	5	5.1	V
PH	Heating consumption	0.5	-	800	mW
RL	Load resistance		adjustable		
RH	Heater resistance	-	31±10%	-	Ω
Rs	Sensing Resistance	10	-	60	kΩ
Scope	Detecting Concentration	200	-	10000	ppm

Figure 2.3: MQ5 Specifications

2.4 Concept of Image Processing

Image processing is the process of converting a physical image to a digital representation and then conducting operations on it to extract valuable information [8]. When implementing specific specified signal processing algorithms, the image processing system normally treats all images as 2D signals. There are various techniques of digital image processing which commonly used nowadays such as medical imaging, videophone, satellite imagery, and others [8]. The aim of this early image processing was created was to increase the quality of the image and to improve the visual effect of the people. Figure 2.4 is the example of showing the vision of camera on to detect the driver's eye whether they are sleepy of not.

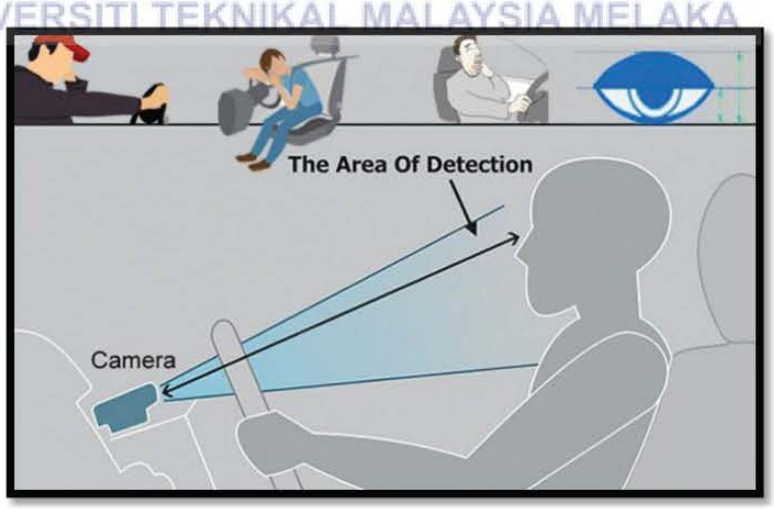

Figure 2.4: Image Processing example in a car

OpenCV which is also called as Open Source Computer Vision Library is a common tool for image processing technology. OpenCV is a cross-platform library that allows us to create real-time computer vision apps. It primarily focuses on image processing, video recording, and analysis, which includes characteristics like face and object detection. Computer vision is a discipline that discusses how to reconstruct, interrupt, and interpret a 3D scene from its 2D images in terms of the structure inherent in the scene. It is concerned with employing computer software and hardware to model and replicate human vision.

Although OpenCV is designed in C++ and has a C++ interface as its primary interface, it also has a less comprehensive but still significant older C interface. The C++ interface displays all of the recent breakthroughs and algorithms. Python, Java, and MATLAB/OCTAVE all have bindings. The online documentation contains the API for these interfaces. Wrappers for a variety of programming languages have been created to encourage greater use.

2.5 Concept of Raspberry Pi Technology

People use the Raspberry Pi all across the world to learn to program, develop hardware projects, automate their homes, and even employ them in industrial applications [12]. The Raspberry Pi project was created with the goal of encouraging the teaching of basic computer science in schools and disadvantaged countries. Figure 2.5 shows an example Raspberry Pi model which is low cost, versatility, and open design, it is frequently employed in various sectors, including weather monitoring. Due to its embrace of HDMI and USB devices, it is mostly utilized by computer and electronic experts.

Figure 2.5: Raspberry PI 1 Model 1

Some individuals purchase a Raspberry Pi to learn to code, while others use it to learn how to code electronics for physical projects. The Raspberry Pi may let you construct your own home automation projects, which is popular among open-source enthusiasts since it puts you in charge rather than relying on a proprietary closed system [13]. Thus, the Raspberry Pi is ideal for adaptive technology since it can show visuals or play films in high-definition resolution, which is ideal for prototyping embedded systems. This product allows you to create complicated and effective structures at a lower cost.

2.6 Related Previous Projects

The study of previous related projects that are largely focused on monitoring drowsiness and drunk is essential to have a good consideration of the project so that fundamental bits of knowledge are gathered able to achieve the objectives of this project. As a result, this part will analyze five past projects that use a similar strategy and have a similar goal to fulfill the main goal of this project.

2.6.1 Drunk and Drive using IoT

This paper introduces Drunk and Drive Detection Using IoT by which is this project basically mixing the use of programming and gear to run it by using an Arduino board. The MQ3 sensor will distinguish the liquor and bring the information from the sensor to the ThingSpeak stage This platform was used to send messages to people in the area [16]. If the alcohol concentration is discovered, the car will not move any further and will be stopped.

2.6.2 Drowsiness Detection and Alert System

The purpose of this study is to propose drowsiness and alert system by using Arduino Uno SMD as the main component. For this research, it alerts the truck driver as well as the owner of the company [11]. Whenever the driver sleepy and closes his eyes for more than a second, the buzzer will be triggered [11]. After that, it will send the driver text messages as warning.

2.6.3 Identification of Driver Drowsiness Using Image Processing

The research used MATLAB software through image processing to implement a driver's drowsiness detection. This project consists of a small camera pointing to the driver's face and eye. The first yawn is detected along with a closed eye which will be recorded regularly. Then, a buzzer will be used to alert the driver if drowsiness is detected [1]. Figure 2.6 is about driver drowsiness using image processing where a video camera installed beneath the front mirror records the driver's face on a regular basis and process on how it executed. To detect the yawn in the first place, the camera's sequence of frame images must be used to recognize and monitor the face. From the identified face, the position of the eyes and mouth is determined. Along with closed eyes, closed eye movement is sensed for yawning detection. It improves the robustness of the false detection method's segmentation [1]. The mouth and eye geometrical traits are then used to identify the yawn. The device alerts the driver to his fatigue with a beep or buzzer, as well as the potentially dangerous driving state if yawning is detected.

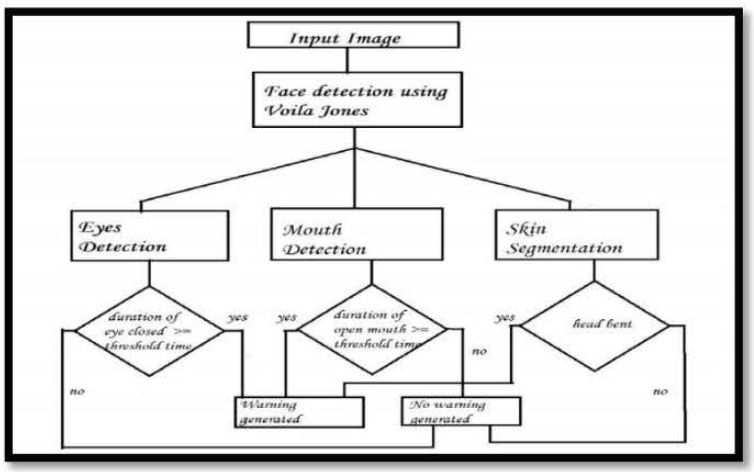

Figure 2.6: Driver Drowsiness using Image Processing

2.6.4 Alcohol Detection based Engine Locking System Using MQ-3 Sensor

The goal of this research is to make a safe driving experience by using an ATmega8 microcontroller and MQ-3 alcohol. Figure 2.7 shows engine locking system where alcohol is able to be detected by using an alcohol sensor that is connected to a microcontroller that already set a permissible limit for alcohol concentration. When this occurs, the vehicle engine system will turn off and the GPS module will detect the present location of the vehicle.

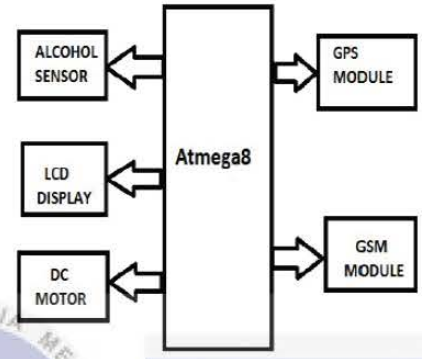

Figure 2.7: Engine Locking System Block Diagram

2.6.5 AI-Based Drowsiness Driver Alert System

The AI-Based Drowsiness Driver Alert System is involved eye-blinking, yawn detection, opening and closing of the eye. When the drowsiness of the driver is detected, this system will alert the driver through the speaker, and the relay will slow down the vehicle [6]. This system also involves some sensors which are temperature sensors, vibration sensors, and alcohol sensors with GPS devices to locate the accident that took place.

2.7 Comparison Between Previous Projects

Table 2.1: Comparison previous related projects

No	Reference	Method	Advantages	Disadvantages
1	[16]	This project is about drunk and drive by using IOT which mix the use of Arduino and programming.	This project able to get accurate level of liquor whether the person is intoxicated state or else ordinary state.	The changes in breathing example will affect the final breath results.
2	[11]	Arduino Uno SMD is the main component for this research which involve buzzer as the alerting system.	When the driver's eye blinking more than 1s, it able immediately to react and give the warning sound through buzzer.	The driver need to use spectacles which it quite disturbing and not really comfortable for the driver.
3	[1]	This research used MATLAB for implementation of driver's drowsiness by with image processing which involve Viola-Jones and Hough Transform.	The research can scan the whole specific part for facial such as eyes, mouth and skin as input for image processing.	Learning MATLAB algorithm is quite challenging and costly if not for educational purpose.
4	[13]	This paper describes about the use of ATmega8 microcontroller and MQ-3 sensor to detect alcohol and sending data through GPS module and GSM module.	Able to giving info and warning to the family members if their driver is having alcohol content.	The GPS module will not able to function if the driver is drunk at the area have bad connection.
5	[6]	The research is about alcohol sensor and Raspberry pi 3 and able to update GPS location to the nearest location if the driver is drunk.	It is good when able to update and give information the location of the driver.	Raspberry pi 3 had slow processing time compare to Raspberry PI 4 and costly.

2.8 Summary

Overall, all related previous research and projects has their own benefits and their own weakness. Some of the projects that use Raspberry Pi 3 is a bit old which mean the processing time is quite slow. Due to project's requirement, using Raspberry Pi 4 is quite reasonable and understandable to implement. The research about eye detection and alcohol detection is crucial in order to understand the concept of the project.

CHAPTER 3

METHODOLOGY

3.1 Introduction

This chapter explains the methods used to achieve the goals of the project and able to create the project. It is a strategy and approach for developing, collecting, and analyzing data to create evidence to support a research study known as methodology. The study design and elaboration of the process flow, as well as the hardware specification, are the three primary aspects of this chapter. To ensure that the project's flow remains steady, detailed research on the employed hardware was conducted in order to gain a clearer picture and a better understanding of how to handle it and the best model to use for this project. This chapter is also important for gaining a broad understanding of the project flowchart. The process flow is described in great detail, and the hardware specs will be detailed after that. The methodology is essential to implement any new project or an improvement to a current project in the market.

3.2 Study Design

The purpose of this project is to develop a drowsiness warning system with an alcohol detector using Raspberry Pi for all drivers in Malaysia. Basically, Raspberry Pi is the brain of this project. Then, an alcohol sensor is used to detect the presence of alcohol and a USB camera has also included in the project to detect the eye of the driver. A buzzer is used in this project to enable the warning system by producing an alert sound to the driver. The software that is used in this project is Raspberry Pi imager which is used to write operating system images to the microSD card. Open CV is also used for processing images which to detect the driver's eye movement and Proteus software to construct the circuit virtually.

3.3 Project of process flowchart

3.3.1 Project Implementation Flowchart

First, a flowchart of the tasks for this final year project is displayed to ensure that each activity is carefully considered and implemented. A flowchart is also prepared to show the process of the procedures that are carried out in this project.

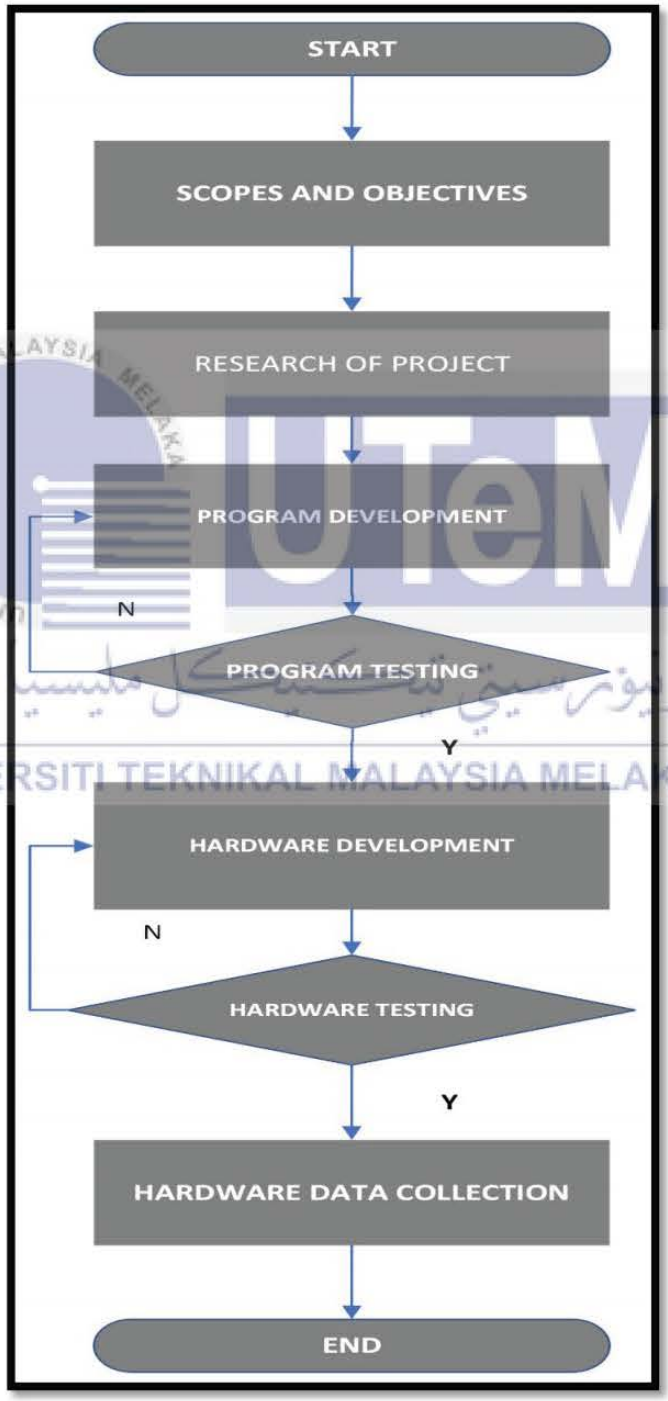

Figure 3.1: Project Implementation Flowchart

By referring to Figure 3.1 above shows, the flowchart of the implementation of the project. For this part, it explains about theoretical part and ensures the project is done by using information. Firstly, for the project implementation, it had divided into three part which are planning, implementing and analysis. An observation was performed according to the sources from literature review. Then the objectives after doing research in the literature review assisted in planning the problem statement, objectives and methodology in order to implement this project. Doing research on the previous project able to determine the hardware and software of the project.

The implement the data collection is the second process of project implementation which came from literature review. The expected outcomes will be determined by knowing the design of the circuit and program code. Open CV is a software for the eye movement detection and Raspberry PI imager used to as the brain of the project.

The final process of this flowchart is about data analysis. The data analysis consists of two major procedure which observe and evaluate the project performance. Another procedure for data analysis is to determine the final outcome. The developed circuit and the coding were observed and evaluated to determine the project performance. From the observation and evaluation for the varies outcome results, it able to evaluate the performance of these projects. Lastly, determine the final outcome with desired results recorded to achieve the objectives of the projects.

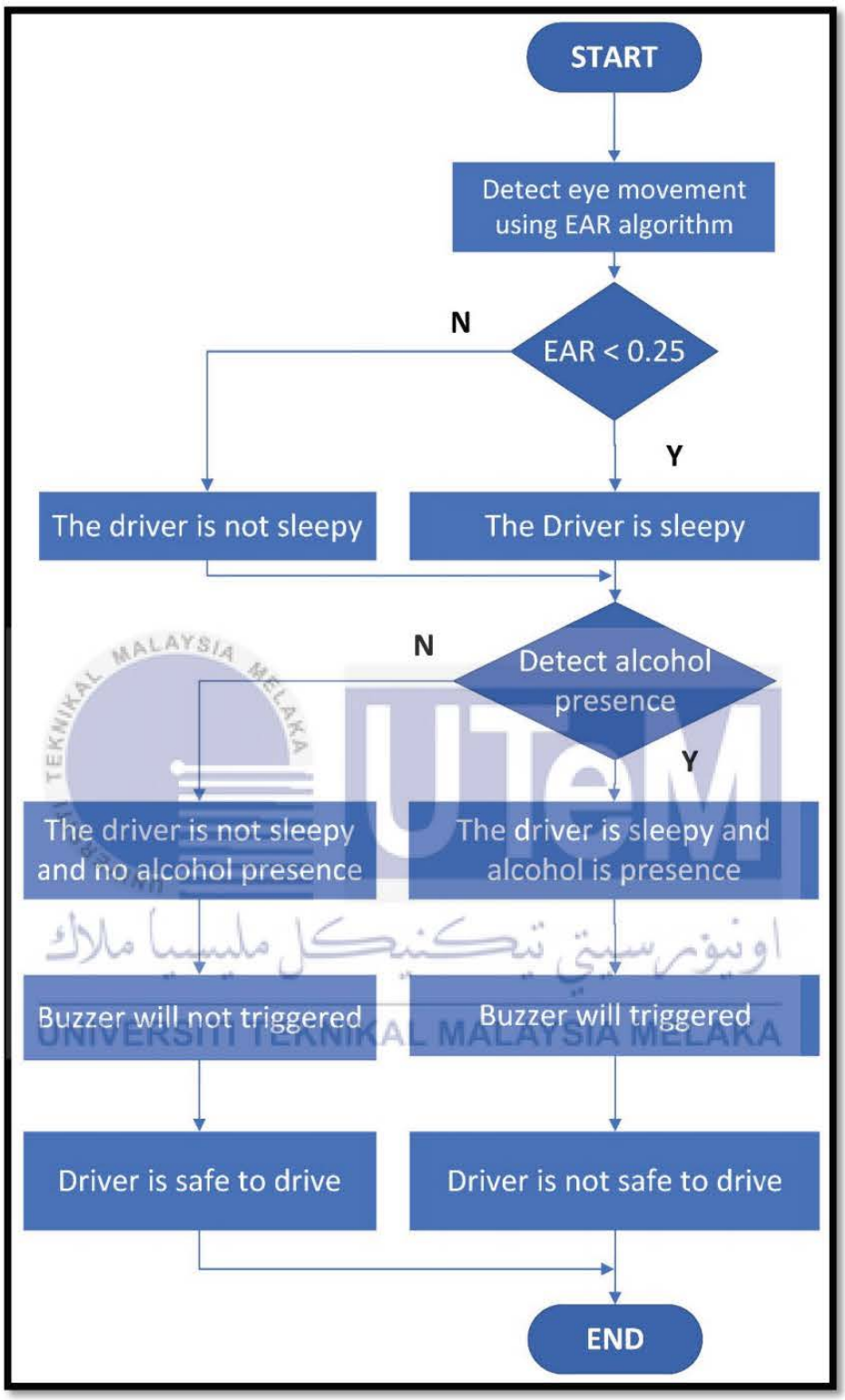

Figure 3.2 Flowchart for drowsiness with alcohol detector

Figure 3.2 shows the steps of the project implementation. For this part, the suitable component is used in order to produce the project. For the software part, the Open CV is used for image processing which to track the driver's eye movement. Python is the programming language used for this project due to the default programming language for the Raspberry Pi system. Proteus software assisted to do virtual circuit simulation as guideline before doing real circuit to ensure no errors in the circuit occur in real time.

The project started by getting input from the camera after the driver enters the car. Next, USB webcam which have been used for eye detection and calculate Eye Aspect Ratio Algorithm (EAR). When the EAR value is less than 0.25, it means the driver was sleepy. Then, alcohol sensor used to detect the presence of alcohol from the driver. Once the presence of the alcohol was detected and the driver detected sleepy in the car, the buzzer produced warning sound to the driver. If one of the conditions such as no alcohol is not detected in the car but the driver detected sleepy, buzzer also will produce warning sound. The buzzer will not produce sound when the driver does not feel sleepy and no alcohol detected in the car which make them safe to drive.

3.4 Hardware Implementation

3.4.1 Raspberry Pi

Figure 3. 3 Raspberry Pi

Raspberry Pi had been originated and used to promote teaching basic computer science in schools and in developing countries. From the Figure 3.3, it is the example of raspberry pi 4 which is another level from the previous version which is enough to use in a pinch on the desktop by producing output 4k video at 60 Hz monitors. Recently, the Raspberry Pi 4 8GB model came out able to offer sufficient ram for desktop computing and database hosting. This raspberry pi 4 is energy efficient and also runs silently due to it being fanless and consuming less power than other computers. Raspberry PI also has a variety choice of ram which are 1GB,2GB 4GB, or 8GB. The transfer data also increase with two USB 2 ports and two USB 3 ports. Lastly, Gigabit Ethernet along with wireless networking and Bluetooth produce fast networking.

3.4.2 Alcohol Sensor

Figure 3. 4 Alcohol Sensor

Gas Sensor as shown in Figure 3.4 is commonly used for sensing gas leakage in home and industry. It is also suitable to detect alcohol due to its high sensitivity and able to take measurements immediately which also have fast response time. The purpose of this sensor on this project is to sense the presence of alcohol from the driver before they start driving. Table 3.1 shows comparison between alcohol sensor which the difference on detecting alcohol reading in ppm.

Table 3.1 Comparison between Alcohol Sensor

Product Name	Range for Alcohol reading(ppm)	Gas Type
MQ3	0.05 ~ 10	Alcohol
MQ2	100 ~ 2000	Alcohol
MQ5	200 ~ 10000	Alcohol, Propane, CH4

3.4.3 Usb Camera

Figure 3. 5 USB Camera

The USB camera as shown in Figure 3.5 used in this project. This camera is plugged into a connector at the Raspberry Pi to detect the eye movement for the project. This camera had a 2048 x 1080 resolution and 30 fps frame rate which is good for detecting images. It has high-definition pixels and true color images which is suitable for this project.

3.4.4 Buzzer

Figure 3. 6 Buzzer

The buzzer as shown in Figure 3.6 used for this project to produce a warning sound to the driver. This buzzer is powered by DC voltage and a low-cost product suitable for this project. It is also reliable and able to produce high sound output to make sure the driver is alert with the situation.

3.5 Software Implementation

3.5.1 Proteus 8

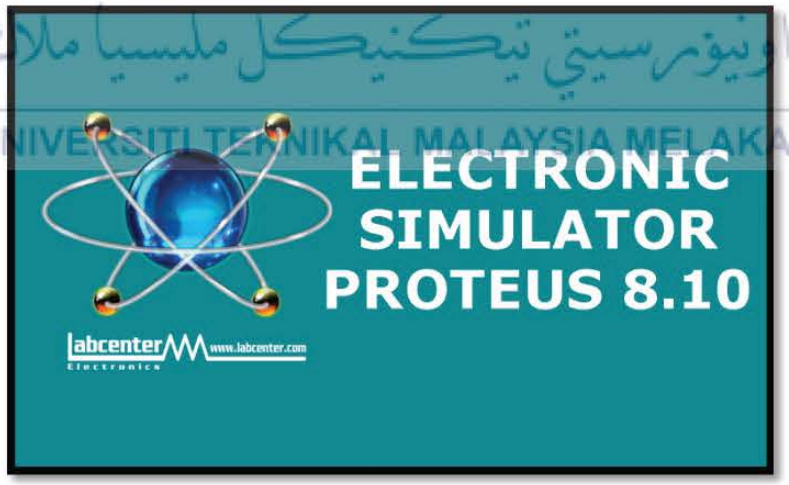

Figure 3. 7 Proteus 8

Figure 3.7 shows Proteus 8 (Proteus Design Suite) is a software tool mainly used for electronic design automation. Most of the design engineers and technicians used this software to develop schematics and electronic prints for manufacturing printed circuit boards. Virtual simulation for this project had been simulated using this software as a guideline before construct the real circuit to ensure able to minimize error occur. For

proteus 8 able to use Raspberry PI in the circuit since Raspberry Pi is the main component of this project.

3.5.2 Open CV

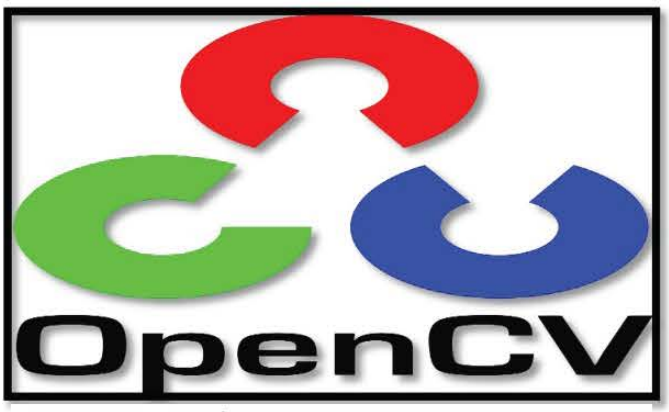

Figure 3.8: OpenCV

Open CV as shown in Figure 3.8 used for this project for the eye movement for drowsiness detection before they drive the car. Open CV means Open Source Computer Vision Library) which is open source mainly for computer vision. The programming language used in OpenCV is python which also the main programming language for Raspberry PI.

3.6 Block Diagram of the Project

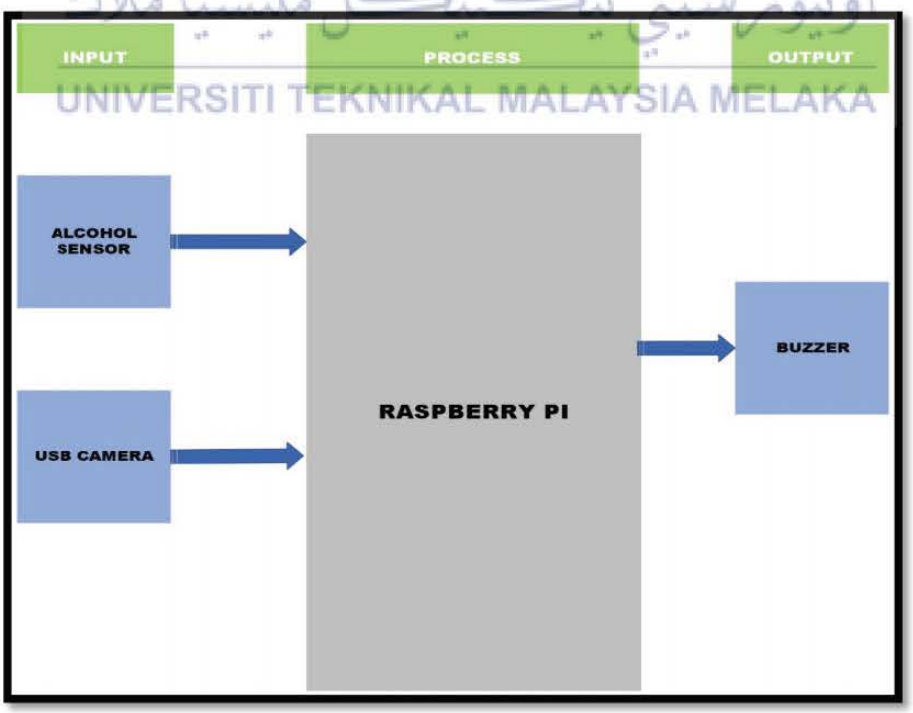

Figure 3.9 Block Diagram

Figure 3.9 shows that the block diagram of this project. The block diagram is a general structure and represents schematic for this project. From this block diagram, the main component for this project is Raspberry Pi. There is two components involve which are alcohol sensor to detect the presence of alcohol sensor and usb camera as input to detect eye movement of the driver to detect the driver is sleepy or not. Raspberry Pi works as component that control the condition that for usb camera and alcohol sensor. For the buzzer, it is a warning system and output for the project which produce sound to alert the driver.

3.7 Summary

The methodology for the drowsiness warning system with an alcohol detector utilizing Raspberry Pi is described and explained in this chapter. One of the most important chapters in project management is project methodology, which ensures that the project may be finished in a systematic way by following according correct project sequences.

CHAPTER 4

RESULT AND ANALYSIS

4.1 Introduction

This chapter is about more details on the outcome and cover the project as a whole. All test results from before the data was finalized, operational conditions, and data analysis are all included. These analyses and evaluations are used as a guide to determine whether the project achieves its main goal.

4.2 Project Circuit Design

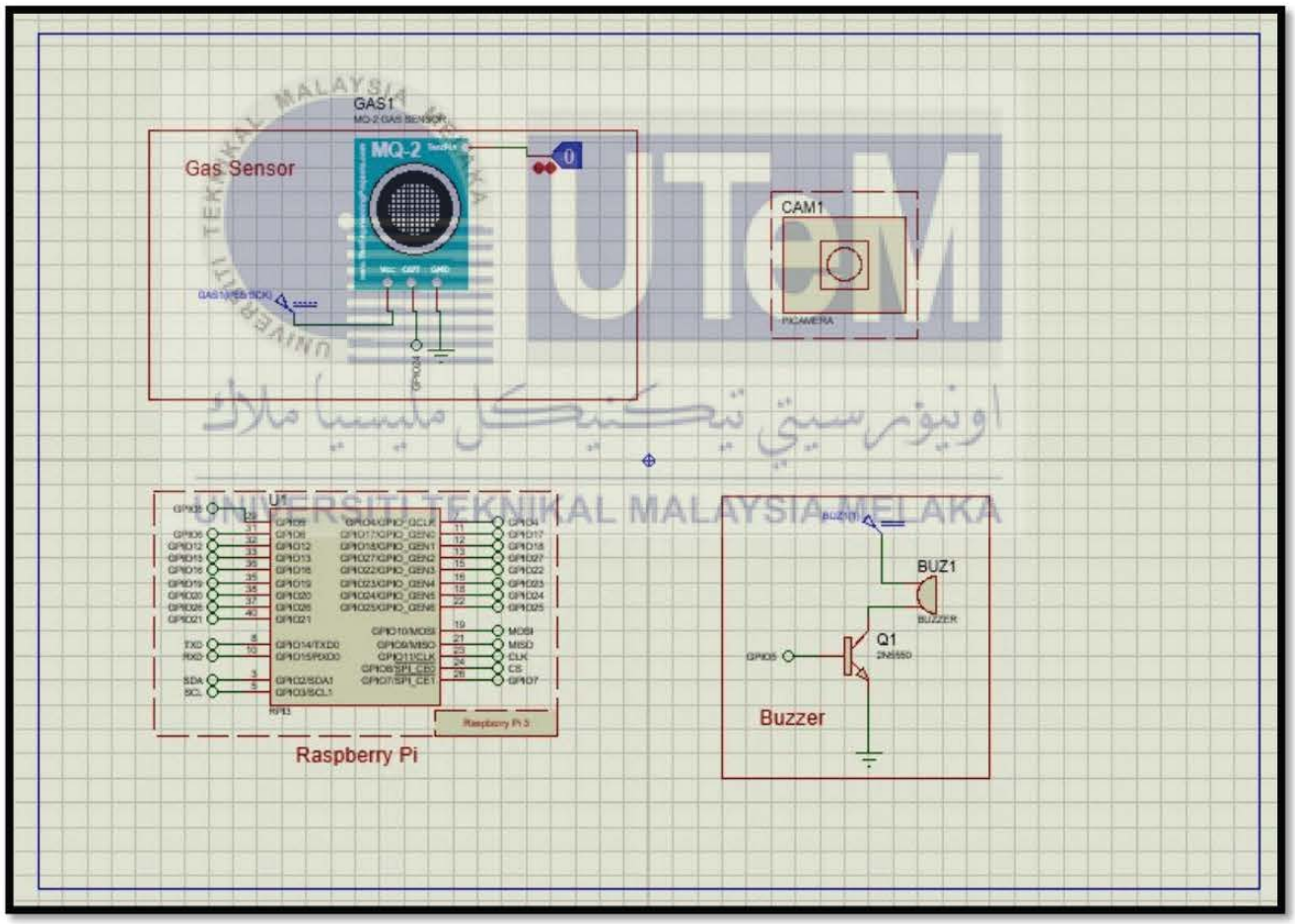

Figure 4.1 Circuit Design With Proteus 8

Figure 4.1 shows the project's initial experiment will be carried out using a Proteus version 8 design as a start. The Raspberry Pi will be the main component of the project. To ensure that the project's primary goal is being achieved, sensors such an alcohol sensor and camera will be added to the circuit that serves as the project's input. Meanwhile, buzzer also will be added into the circuit as output of the main project which to produce the warning sound.

4.3 Software Development

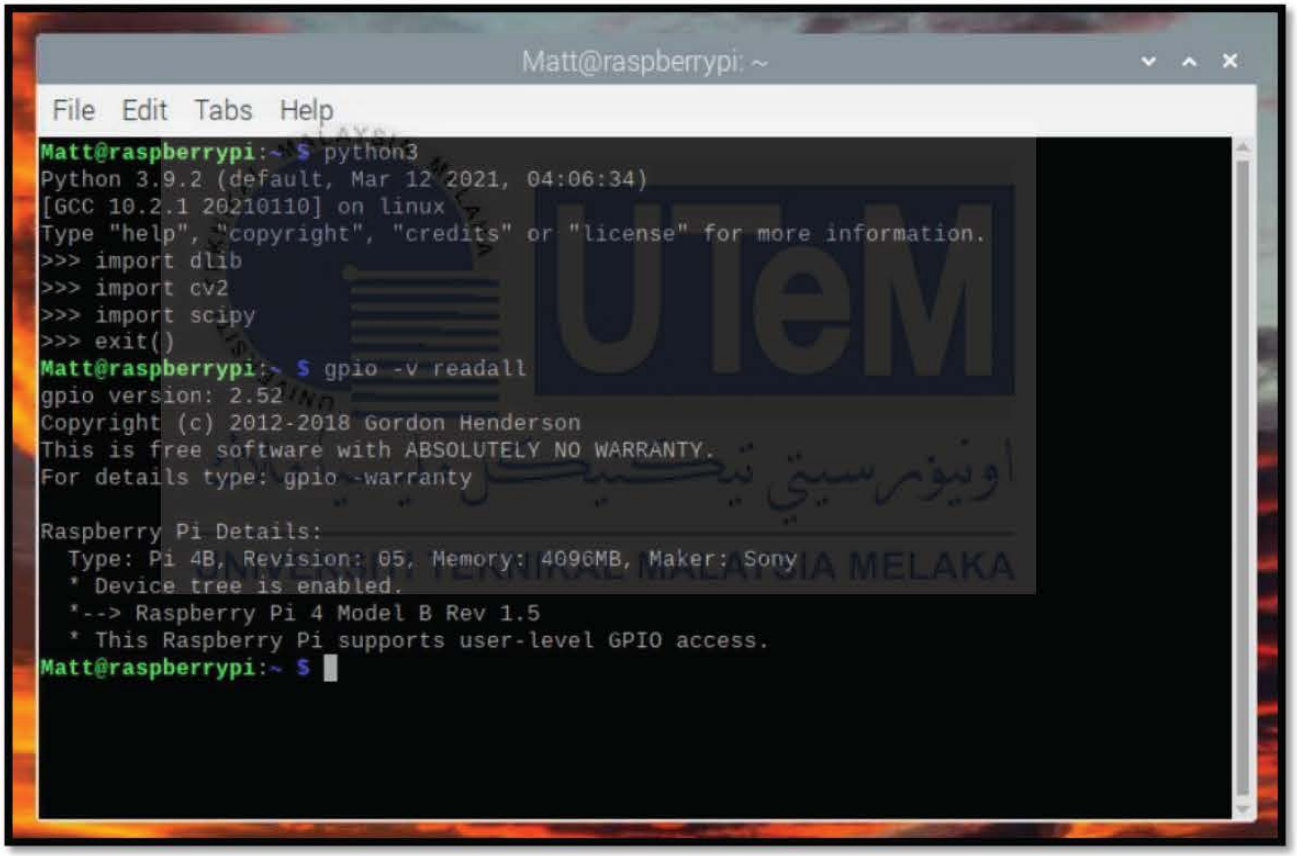

Figure 4.2 List of Necessary Library Installed in Raspberry Pi

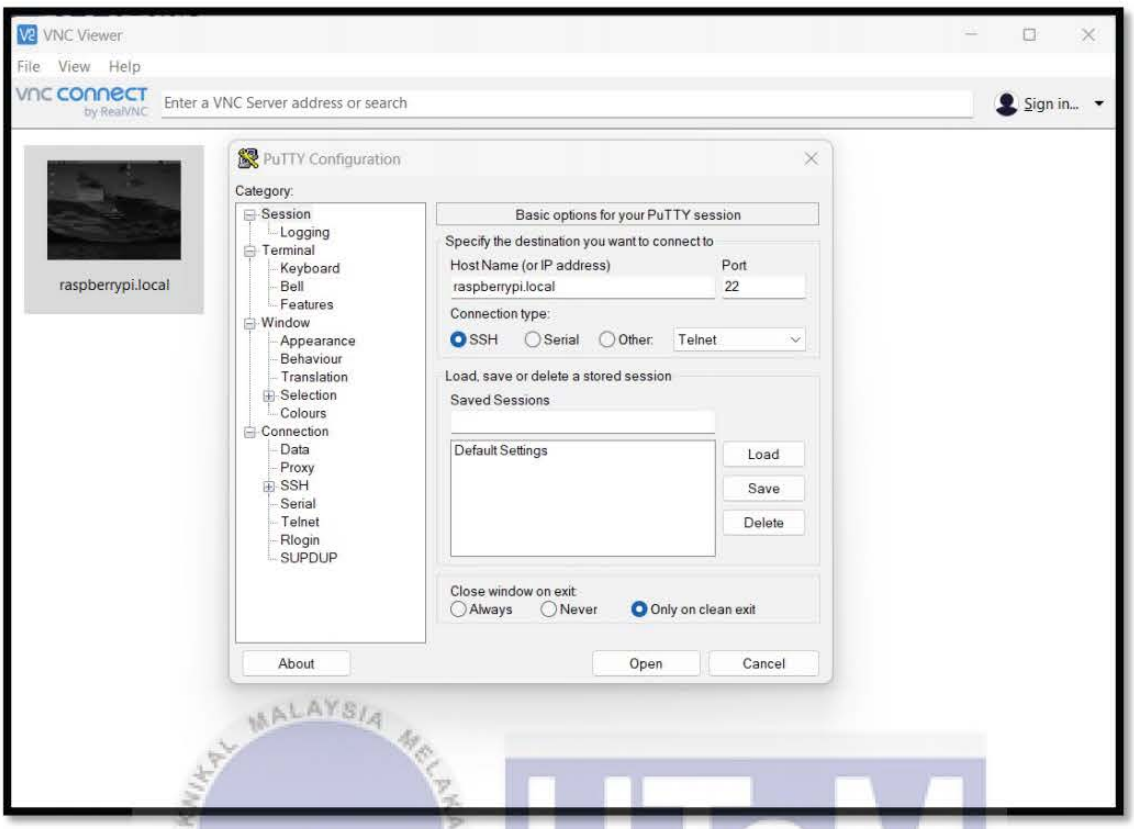

Figure 4.3 Software used in Laptop to connect with Raspberry PI

Figure 4.2 and Figure 4.3 shows the beginning of the software development of the project, Raspberry pi need operating system and necessary library to execute the program. VNC viewer is needed since laptop used to control the raspberry pi wirelessly. Putty apps used to make sure VNC viewer in the windows and raspberry pi os are able to connect among each other. To execute the program inside the raspberry pi operating system, OpenCV installed as the main library which involve dlib, adafruit, scipy.spatial import distance library and GPIO that execute the code that used for this project. The main language version used in this Raspberry Pi 4 for this project is Python 3.9. First library used is adafruit library which used for converter for analog alcohol sensor since the raspberry pi 4 does not have pin for analog input. Dlib and scipy.spatial import distance library used for image processing library which is more specific on detecting eye movement and the coordinate of the eye. GPIO library installed to gain access for the raspberry pi pin since the buzzer and alcohol sensor needed to connect and execute the project.

4.4 Hardware Development

In order to create this project, the following hardware components were used: an Raspberry Pi 4 with 4GB ram, an alcohol sensor (MQ5 sensor), USB camera, 4 channels ADS1115 ADC module and a buzzer. For this project, a Raspberry Pi 4 board is the main component of the project which to process the image processing from the USB camera, execute the coding for the converter for the analog alcohol process and produce the output for the buzzer. All the code and library running in the raspberry pi operating system and respond with output to the buzzer by producing sound to the buzzer through GPIO pin from the Raspberry Pi.

Figure 4.4 Initial hardware and prototype used

4.5 Prototype Development

Figure 4.5 Project Prototype

Figure 4.5 shows the prototype model for the drowsiness warning system with alcohol sensor (MQ5). This warning system indicates a situation at the driver seat replicates the version of the actual car. The model for the prototype is made out of a plastic container, which will also be used as a stand for the car steering. Alcohol sensor placed at the right of the car steering while the buzzer is opposite of the sensor. The USB camera placed near to the car steering which also suitable place to detect the driver's eye when they are sitting. Next, the Raspberry Pi 4, and the rest of the circuit are inside of the prototype container which at the base of the container so that all the components have stable place.

4.6 Project Workflow

The development of drowsiness warning system with an alcohol detector using Raspberry Pi is designed for drivers to give alert before they drive the cars which they need to check on their eye to get the measurement about Eye Aspect Ratio (EAR) which to determine that they are sleepy or not and alcohol sensor the sense the presence of the alcohol from the driver's seat surroundings. At first, Raspberry Pi needs to be supplied with power from laptop by using type-c cable. Next Raspberry Pi only able to turn on when the power cable is connected to USB port from the laptop and using LAN cable which using same Wi-Fi connection. Figure 4.6 shows VNC viewer will display the raspberry pi operating system remotely and able to take control from the laptop. When the operating system is out, the raspberry pi is ready to use.

Figure 4.6 Raspberry Pi ready to use

The user able to control the flow of the project in the command prompt inside the raspberry pi to execute the related code for this project. User will need to type command (cd Desktop) and push arrow up key which display (python3 eye_alcohol.py) and press enter to run the program. Figure 4.7 shows user hold a hand sanitizer since it has alcohol content which in close to the MQ5 sensor, this project able to experiment and activate the MQ5 sensor. Figure 4.8 shows the user also able to need to look into the camera when it has indicated green light inside the camera which means that the camera is scanning the eye of the user. Finally, when the condition inside the code is True, the buzzer will not produce sound since the requirement is EAR value is high and PPM value is less than 2500 which means that the driver is safe to drive because of not sleepy and alcohol content is still allowed for the specific value.The buzzer will triggered when the user is has alcohol presence which detected by the sensor or EAR value is not exceeded 0.25 which considered the driver is sleepy.

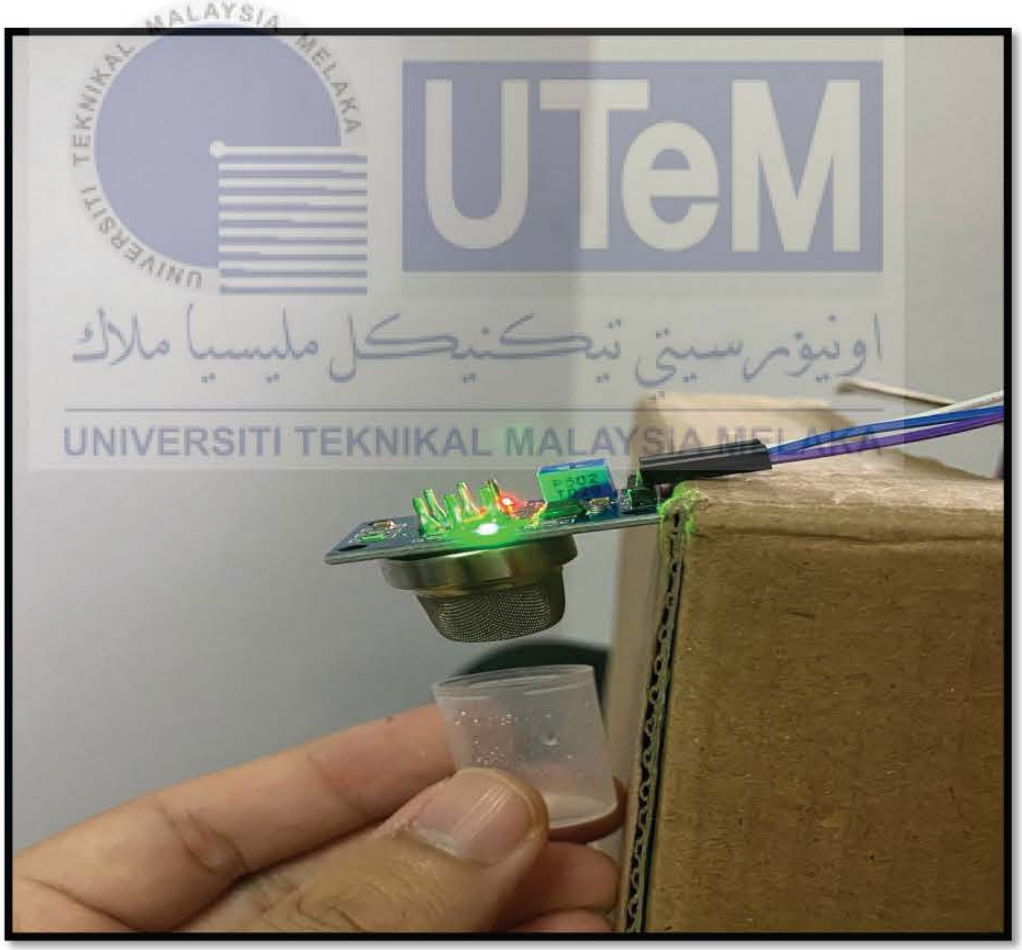

Figure 4.7 MQ5 sensor detecting alcohol

Figure 4.8 USB camera scanning the user's eyes

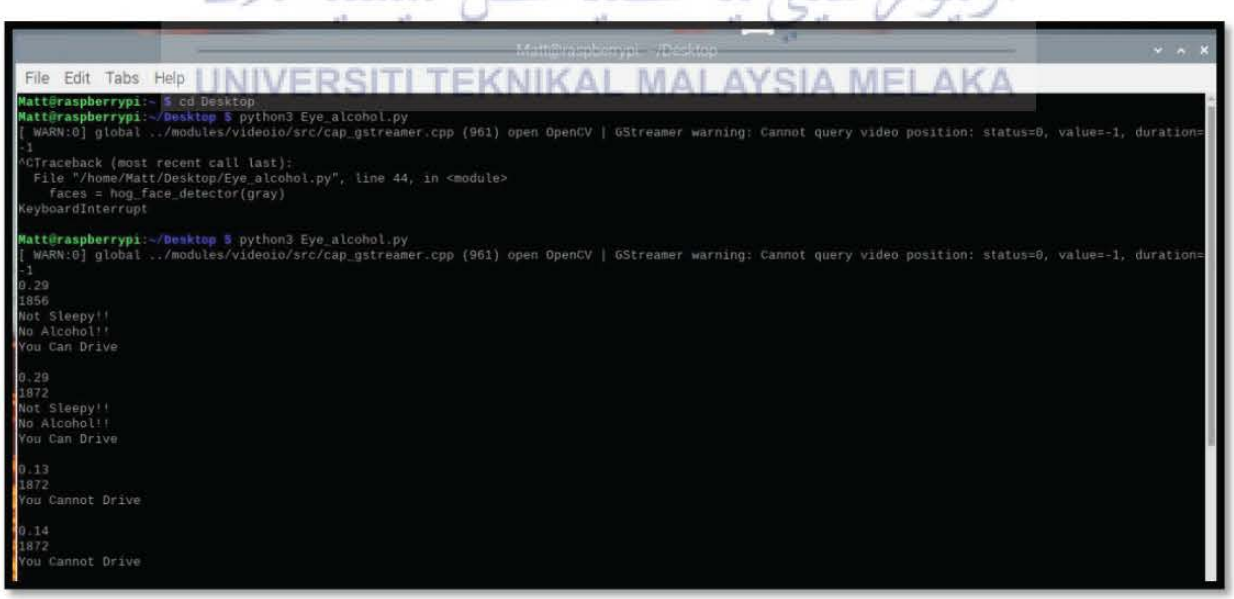

Figure 4.9 Executing the coding

4.7 Data Analysis

The results of the alcohol sensor detection, the eye detection from USB camera, are all measured as part of the evaluation of this project. The captured data will be thoroughly explained in this section.

4.8 Alcohol Detection Result

Figures 4.9 and Figure 4.10 show that any rise in voltage is accompanied by a rise in gas concentration. H2, LPG, CH4, CO, Alcohol can all be detected by alcohol sensor. The sensor operates in accordance with its sensitivity which voltage and gas concentration recorded.

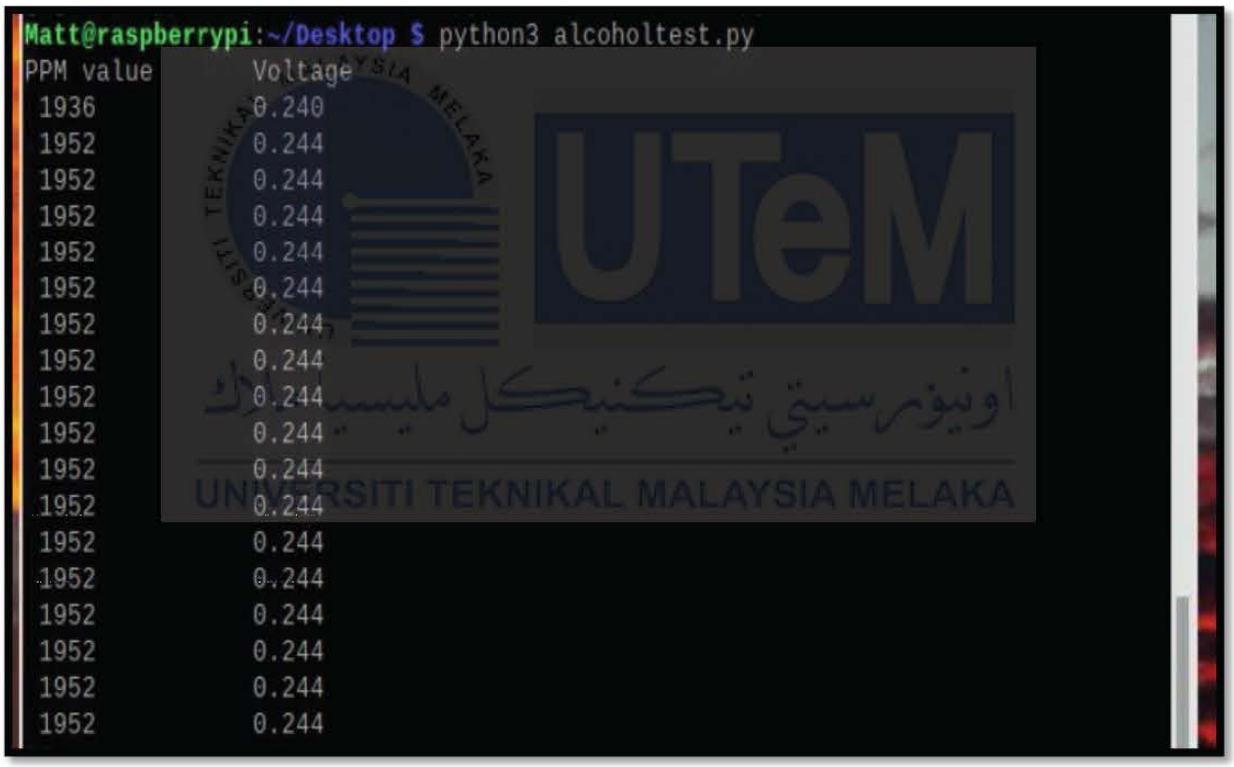

Figure 4.10 Initial Reading for Alcohol Sensor

Figure 4.11 Final Reading for Alcohol Sensor when detecting alcohol

Through the experiment, it was discovered that even if there was no alcohol present to trigger the sensor, it still had value because of how it was designed to detect concentration in the surrounding area. The data in Table 4.1 shows the sequence of concentrations, starting with the initial value after preheating and continuing until alcohol is detected in the project after reaching a value of 2500 that indicates the presence of smoke, and figure 4.12 displays a line graph plotted against the gas concentration at a voltage change.

Table 4.1 Experimental Result using Alcohol Sensor

Voltage Changes on Alcohol Sensor (V)	Concentration (PPM)
0.246	1968
0.322	2560
0.446	3568
0.592	4736
0.710	5696

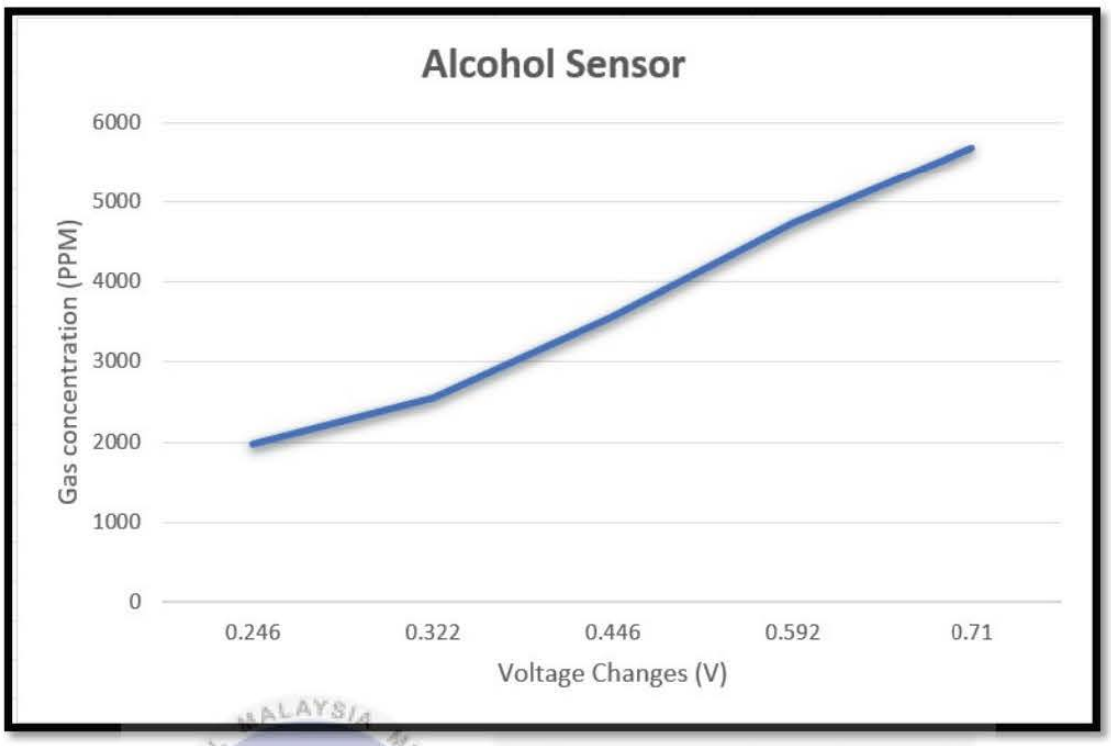

Figure 4.12 Line Graph for Alcohol Sensor

4.9 Camera Detection Result

EAR value is used and able to calculate the driver's eye even though they have different type of eyes. In this experiment, USB camera are each subjected to about three people with 2 condition each which are during day or night and situational condition such as small eyes, normal eyes and using spectacles. Table 4.2 includes the information type of the driver's situation and the EAR value for drowsy for each type of situation that applied to them.

Table 4.2 Final Reading for Alcohol Sensor when detecting alcohol

Type of Driver's Eye And Situation	(Eye Aspect Ratio) EAR value for Drowsy
Person A (Day and Normal Eye Size)	0.23
Person A (Night and Normal Eye Size)	0.17
Person B (Day and using spectacle)	0.19
Person B (Night and using spectacle)	0.16
Person C (Day and small eye)	0.21

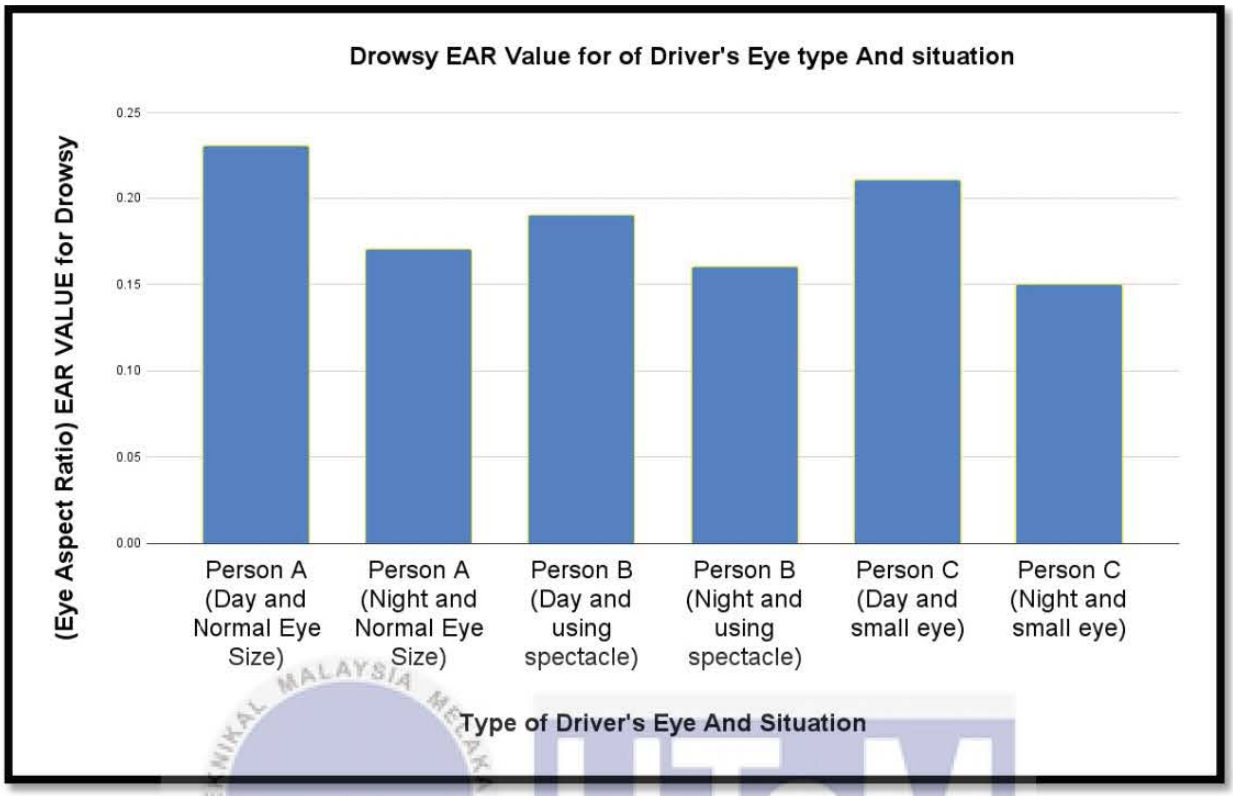

Figure 4.13 Bar Chart for EAR value of the situational driver.

According to the observations made, the EAR (Eye Aspect Ratio) value for situational driver responses in the project are result of some different technical issues that are related. One of them is the place need some lighting so that the eye able to be detected by the camera. If the room too dark, the camera is not able to detect the eye pattern and EAR (Eye Aspect Ratio) value is not able be recorded. For the driver that using spectacles it will be a bit tricky due to sometimes the USB camera confused and detected the reflection on the person spectacles' reflection light.

4.10 Summary

This chapter discusses one of the project's finished deliverables. The project's data analysis and prototype results of warning system of the drowsiness and alcohol detection and data analysis for the project are provided. When Ear value is less than 0.25 and PPM value is more than 2500 ppm, the buzzer will produce sound which indicate the driver is sleepy and sensor able to detect alcohol presence from the driver.

CHAPTER 5

CONCLUSION AND RECOMENDATIONS

5.1 Introduction

This chapter is specifically to conclude the whole project implementation, future recommendations and project potential for the project.

5.2 Conclusion

For the conclusion this project was successfully finished, fully functional and meets all the objectives. The project focuses on the sound that the car's buzzer makes to warn the driver before they drive the car. As we know that, car accidents that occur nowadays is a very serious matter which cannot underestimated. This is a situation that we are not able to predict when it will occur. Building a warning system which is drowsiness and alcohol detector is reasonable which it able to give warning to the driver to be alert. When the driver is alert, they able to overcome the careless which to prevent traffic accidents occur due to sleepy or alcohol presence from the drivers. By using buzzer as the warning system, the driver needs to check if they contain alcohol or sleepy before they even drive. This system not only giving the warning to the driver, but also give awareness to the driver's surroundings people to convince they not to drive for their own safety.

5.3 Future Works And Recommendation

Some recommendation also can be made to make the prototype more useful and have better improvement in future such as by upgrading the specifications for eye detection especially during night in term of camera so the detection for eye accuracy is improved. The alcohol detection also can be improved which able to calculate the alcohol content consume and display it in the car by the drivers. Lastly, adding another related sensor such GSM sensor to give coordinate to the nearby family members by giving them notification if the driver is has alcohol content or sleepy before they drive the car.

5.4 Project Potential

This project has some criteria and potential for future us such as the project has high sensitivity alcohol detection and has high response time to detect surroundings gas especially alcohol. The USB camera used also has high accuracy to detect the driver's eye which is really crucial to detect the driver is sleepy or not. The target market for commercialization for the project is the researcher for vehicle related business for future better improvement for detecting alcohol and drowsiness situation. This project also can be applied for individual user for their own safety purposes.

APPENDIX

Eye_alcohol.py

```
import cv2                                          #open-source library focus on image processing (image and videos).
import dlib                                         #lib used to estimate location of 68 coordinates (x,y) in person face.
from time import sleep                              #execution delay for the program.
from scipy.spatial import distance                  #to calculate euclidean
import RPi.GPIO as GPIO                             #initialise GPIO pin used
import time                                         #initialise time
import board                                        #initialise for ADC board (for specific circuit purpose)
import busio                                        #initialise for busses for scl and sda)
import adafruit_ads1x15.ads1015 as ADS
from adafruit_ads1x15.analog_in import AnalogIn     #initialise adc analog in ADS1115

i2c = busio.I2C(board.SCL, board.SDA)               #integrated circuit bus(data tranfer for scl and sda)
ads = ADS.ADS1015(i2c)
ads.gain = 1

chan = AnalogIn(ads,ADS.P0)


#eye blink detection
#to calculate between 2 points.
def calculate_EAR(eye):
    A = distance.euclidean(eye[1], eye[5])
    B = distance.euclidean(eye[2], eye[4])
    C = distance.euclidean(eye[0], eye[3])
    ear_aspect_ratio = (A+B)/(2.0*C)
    return ear_aspect_ratio

cap = cv2.VideoCapture(0)                                   #for processing image initialisation.....
hog_face_detector = dlib.get_frontal_face_detector()
dlib_facelandmark = dlib.shape_predictor("shape_predictor_68_face_landmarks.dat")
#count=0
```

```
buzzer=12                                           #for buzzer initialisation
count=0
GPIO.setmode(GPIO.BCM)
GPIO.setwarnings(False)
#GPIO.setup(14,GPIO.IN)
GPIO.setup(buzzer,GPIO.OUT)
#GPIO.output(buzzer,False)

while True:
    _, frame = cap.read()
    gray = cv2.cvtColor(frame, cv2.COLOR_BGR2GRAY)

    faces = hog_face_detector(gray)
    for face in faces:

        face_landmarks = dlib_facelandmark(gray, face)          #to detect left and right eye.
        leftEye = []
        rightEye = []

        for n in range(36,42):
            x = face_landmarks.part(n).x
            y = face_landmarks.part(n).y
            leftEye.append((x,y))
            next_point = n+1
            if n == 41:
                next_point = 36
            x2 = face_landmarks.part(next_point).x
            y2 = face_landmarks.part(next_point).y
            cv2.line(frame,(x,y),(x2,y2),(0,255,0),1)
```



```
        for n in range(42,48):
            x = face_landmarks.part(n).x
            y = face_landmarks.part(n).y
            rightEye.append((x,y))
            next_point = n+1
            if n == 47:
                next_point = 42
            x2 = face_landmarks.part(next_point).x
            y2 = face_landmarks.part(next_point).y
            cv2.line(frame,(x,y),(x2,y2),(0,255,0),1)

        left_ear = calculate_EAR(leftEye)
        right_ear = calculate_EAR(rightEye)

        EAR = (left_ear+right_ear)/2                        #EAR calculation
        EAR = round(EAR,2)                                  #round off 2 decimal places
```

```

        if (EAR>0.25 and chan.value<2700):                  #EAR value >0.25 and alcohol value <2700.....  buzeer not triggered....
            GPIO.output(buzzer,GPIO.LOW)
            print(EAR)
            print(chan.value)
            print("Not Sleepy!!")
            print("Alcohol Content is less than default value!!")
            print("You Can Drive\n")
            sleep(1.0)
        else:
            GPIO.output(buzzer,GPIO.HIGH)
            print(EAR)
            #print(chan.value)
            #print("Alcohol exceeded default value!!!")
            print("You Cannot Drive\n")
            sleep(1.0)

    #count=count+1

cap.release()
cv2.destroyAllWindows()
```

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