A

PROJECT REPORT

ON

IoT based Alcohol Detection & Accident Prevention System

Submitted by

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Maulik Bhatt (15IT066)

Nishit Shah (15IT068)

For Partial Fulfillment of the Requirements for Bachelor of Technology in Information Technology

Guided by

Prof. Kanu G. Patel

April, 2019

Information Technology Department

Birla Vishvakarma Mahavidyalaya Engineering College

(An Autonomous Institution)

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Gujarat, INDIA

Birla Vishvakarma Mahavidyalaya Engineering College

(An Autonomous Institution)

Information Technology Department

AY: 2018-19, Semester II

CERTIFICATE

This is to certify that the project work entitled **"IoT based Alcohol Detection & Accident Prevention System"** has been successfully carried out by **Karan Bhut(15IT012), Brijesh Nasit(15IT065), Maulik Bhatt(15IT066), Nishit Shah(15IT068)** for the subject **IT442-Minor Project II** the academic year 2018-19, Semester-II for partial fulfillment of Bachelor of Technology in Information Technology. The work carried out during the semester is satisfactory.

Prof. Kanu G. Patel	Dr. Keyur Brahmbhatt
IT Department	Head, IT Department
BVM	BVM

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Date: 24th April, 2019

CERTIFICATE

This is to certify that **Mr. Karan Ashokbhai Bhut (15IT012), B.Tech (Information Technology)** student from B.V.M. Engineering College, V.V. Nagar, has done his project Work titled **"IoT Based Alcohol Detection & Accident Prevention System"** in our company from 31.12.2018 to 22.04.2019 as part of curriculum.

We have noticed that, during this period, he has shown keen interest in his assignments & was also regular in attendance.

Yours truly,

Manager Administration

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This is to certify that **Mr. BRIJESH MUKESHBHAI NASIT (15IT065), B.Tech (Information Technology)** student from B.V.M. Engineering College, V.V. Nagar, has done his project Work titled **"IoT Based Alcohol Detection & Accident Prevention System"** in our company from 31.12.2018 to 22.04.2019 as part of curriculum.

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This is to certify that **Mr. Nishit Ashish Shah (15IT068), B.Tech (Information Technology)** student from B.V.M. Engineering College, V.V. Nagar, has done his project Work titled **"IoT Based Alcohol Detection & Accident Prevention System"** in our company from 31.12.2018 to 22.04.2019 as part of curriculum.

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ACKNOWLEDGEMENT

Our experience of minor project II has been successful, thanks to the support staff of many friends & colleagues with gratitude. We wish to acknowledge all of them.

However, we wish to make special mention of the following.

First of all, we are thankful of our Industry guide **Mr. Dhaval Radadiya**, internal guide **Prof. Kanu G. Patel** and the project coordinators **Dr. Zankhana Shah and Prof. Chintan Mahant** under whose guideline we were able to complete our minor project II. We are wholeheartedly thankful to them for giving us their valuable time & attention and for providing us a systematic way for completing our minor project II in time.

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ABSTRACT

The aim of this project is to provide enhancement in the vehicle for the prime reason being security. The system includes the Alcohol detection of the driver, to prevent the road accidents because of the drunken driving. Furthermore, the project enhances the safety of user's car by means of Anti-theft detection, which tracks the location of car & decides whether car is in the specified range or not. This project also includes the drowsiness detection of the driver, by means of high-resolution pi camera. The pi camera in accordance with other python libraries such as OpenCV & Dlib, will decide whether the driver is drowsy for a specified time limit or not. If the driver is drowsy, then preventive measures are taken to awaken the driver. This whole project uses Raspberry Pi for the controlling & monitoring the electronic components like sensors, camera etc.

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ABBREVIATIONS

- ADC: Analog to Digital Converter
- CDC: Centres for Disease Control and Prevention
- DUI: Driving under Influence
- EAR: Eye Aspect Ratio
- GPS: Global Positioning System
- GSM: Global System for Mobile Communication
- IoT: Internet Of Things
- NCRB: National Crime Records Bureau
- NHTSA: National Highway Traffic Safety Administration
- OpenCV: open source computer vision library
- SMS: Short Message Service

Chapter:1 Introduction

1.1 Brief overview of the work:

Drunk driving is a very dangerous behavior because excessive consumption of alcohol causes distortion in thought pattern of drivers. The investigation conducted by the CDC(Centers for Disease Control and Prevention) shows that about 30%–40% of traffic accidents are related to drunk driving. In present times, the cases of traffic accident caused by drunk driving has increased rapidly. It has, therefore, become evident that drunk driving does great harm to public security.

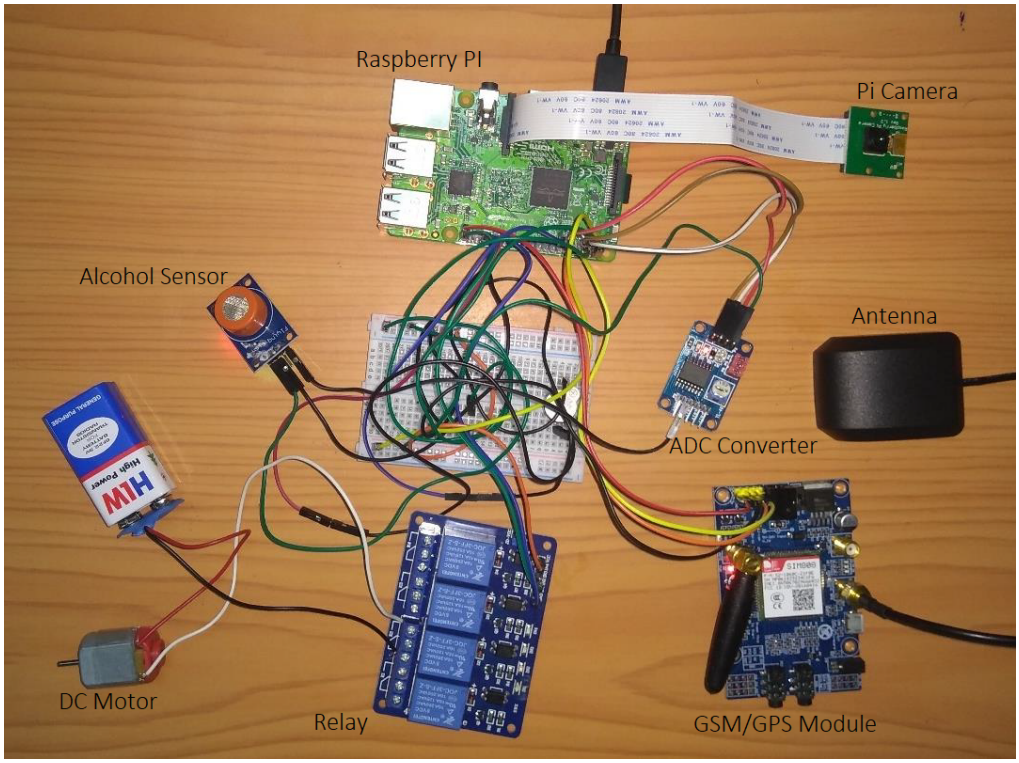

Figure 1.1: Alcohol Detection and Accident Prevention System Circuit

In this project, the alcohol detector made of the alcohol sensor (MQ3 sensor) senses the alcohol molecules in air present around it. If alcohol molecules cross the fixed threshold value, the system will lock the car ignition engine and send a warning text as well as car location via SMS to family member of driver or police and buzzer starts ON to alert other passengers of vehicle. Another feature of system is anti theft feature which is used check whether car is inside fixed area if not then location of car will be sent to the car owner via SMS. The camera installed in car checks whether driver is awake or not by eyes blinking. If

eyes of driver are closed for more than 3 seconds, a buzzer starts buzzing to wake up the driver and alert him.

1.2 Project Objective:

The main objectives of our project are as follows:

1) To detect presence of alcohol and lock the car ignition system if volume of alcohol molecules is more than fixed threshold value as well as inform driver's family members via SMS.
2) To awake the driver if he closes eyes for more than 3 seconds.
3) To provide anti-theft security by sending car location to car owner through SMS.

1.3 Project Scope:

The project work is complete on its own automatically by detecting presence of alcohol, informing family members through SMS, locking car ignition system, awakening driver by buzzer and sending location details via SMS.

1.4 Project Modules:

- **Interfacing with Raspberry Pi:**

  In this module, we will setup our Raspberry pi with the PC for programming. Also, we will setup the Alcohol Sensor, to detect the presence of alcohol in the car.

- **Controlling the DC Motor:**

  In this module, we will connect the DC motor as the prototype for the car engine. If the alcohol is detected then, we will immediately stop the DC Motor.

- **Interfacing GSM & GPS with Raspberry Pi:**

  In this module, we will configure the GPS module to send the location Coordinates. While, we are using the GSM module to enabling the SMS based services.

- **Anti Theft Module:**

  In this module, our system will check whether the car is inside fixed area or not. In our project, radius is 5 kilometres.

- **Image Processing:**

  In this module, we will first capture the frame through a pi camera that transfers data to OpenCV. After the frame has been captured, we will convert the RGB frame into the grey. So, that we can implement face detection.

- **Eye Detection & Driver Alertness Module:**

  Using OpenCV we will find if the eye is open or closed. If the eye is closed for 3 seconds, then we will use buzzer to awaken the driver.

1.5 Project Requirements

1.5.1 Hardware Requirements:

- Raspberry Pi:

  The Raspberry Pi is a low cost, credit-card sized computer that plugs into a computer monitor or TV, and uses a standard keyboard and mouse.

- Pi camera:

  The Pi Camera Module can be used to take high-definition video, as well as photographs. It supports 1080p30, 720p60 and VGA90 video modes, as well as still capture. It attaches via a 15cm ribbon cable to the CSI port on the Raspberry Pi.

- DC Motor:

  A DC motor is any of a class of rotary electrical machines that converts direct current electrical energy into mechanical energy. Here We use DC Motor as Car engine.

- SIM 808 module:

  SIM808 module is a GSM and GPS two-in-one function module. It is based on the latest GSM/GPS module SIM808 from SIMCOM, supports GSM/GPRS Quad-Band network and combines GPS technology for satellite navigation.

- MQ3 Alcohol Sensor:

  It is a low-cost semiconductor sensor which can detect the presence of alcohol gases at concentrations from 0.05 mg/L to 10 mg/L. The sensitive material used for this sensor is SnO2, whose conductivity is lower in clean air.

1.5.2 Software Requirements:

- Raspbian OS:

  Raspbian is a Debian-based computer operating system for Raspberry Pi. Since 2015 it has been officially provided by the Raspberry Pi Foundation as the primary operating system for the family of Raspberry Pi single-board computers.

- OpenCV:

  OpenCV is a library of programming functions mainly aimed at real-time computer vision. Here we use this for drowsiness detection.

- Python:

  Python is one of the most popular languages in the world and has been around for more than two decades. It is heavily used in academic environments and is a widely supported platform in modern applications, especially utilities, and desktop and Web applications. Python is highly recommended as a language for Raspberry Pi.

1.6 Company Profile

Company Name: PLUS INFOSYS

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Chapter 2: System Analysis

2.1 Comparison of Existing Applications with our Project

There are so many works done in the area of vehicle safety and security highlight the development of commercial devices for certain risks mitigation such as obstacle detection and anti-braking system, air bag, anti-theft and vehicle tracking etc. Also, innovative ideas and methodologies towards vehicle safety, traffic management etc. have been projected by researcher's or project developers over the recent years globally. A different sensing methodologies were used for drunk driver detection such as the use of chemical gas sensor [8], design of more accurate alcohol sensor with electric fan suction and oxygen level detection of exhaled breath, use of body area sensors for alcoholic and mood dysfunctional detection [9] and detecting behaviour pattern of driver using iris image capture and processing to detect eyes condition that is affected by blood alcohol concentration level [10].

Other proposed additionally different ideas of vehicle control to prohibit driving under the detection of drunk driver condition such as triggering of ignition interlock system[14]. This would enable timely sharing of collectively information of drunk drivers, accidents or road congestion problem etc. among the vehicles on the road thus enhancing on-road safety of many vehicles.

In our project, we can detect alcohol present in the vehicle and immediately stop the vehicle to prevent accident and turning buzzer ON to alert other passenger of vehicle. If vehicle is not in the specified area then alert through SMS will be sent to owner of vehicle or police for tracking, it can be used as theft detection. Driver's eye image is also taken by system frequently for drowsiness checking, if driver is not awakened then by turning ON buzzer the driver is awakened.

2.2 Literature review

The main objectives of this project are to design and implement a IoT based Alcohol Detection & Accident Prevention System that is capable of detecting presence of alcohol concentration around driver, detect drowsiness and provide anti-theft feature.

Increasing population, higher consumption of alcohol during driving, fast and latest automobile technologies etc.., Due to all this factor nowadays people facing so much problems on the road.

According to report of National Crime Records Bureau (NCRB) [5] says that 40 people younger than 25 die in road accidents all around the world. It states that the intoxicated driving is a central point for the rising of death on roads. The alcoholic driving fatalities in the year 2009, till the 27th November were 11,769. It shows that the problem of alcoholic driving is a long way from being done. In the 2009 DUI national statistics released by the NHTSA (National Highway Traffic Safety Administration) 11,773 people died in alcohol related crashes. Most of the accidents happen outside the cities are because of drunken driving and no testing methodology is adopted to stay away from these fatalities in highways.

Different approaches for detection of driver drowsiness and alcohol intoxication detection are presented below:

- Bhuta et al [2] proposed "Alcohol Detection and Vehicle Controlling". Arduino is used in this system. An alcohol detector and GPS module, GSM module are connected to the arduino board. When the alcohol level in the driver‟s body crosses a particular limit vehicle‟s ignition will off and GPS module finds out the location and alert will be sent to the police and family using GSM module.
- Gupta et al [3] proposed "Alcohol Detection with Vehicle Controlling". This system is mainly used for preventing accidents that are occurring due to drunken driving. An alcohol detector is connected to the PCB (Printed Circuit Board).When alcohol level crosses a permissible limit ignition of the vehicle is stopped. This system should be installed inside the vehicle.
- Phalak et al [6] proposed "Smartphone and Sensor Based Drunk Driving Prevention System". According to this system DUI (Driving under Influence) of alcohol is the major cause of accidents. So they proposed a system to find the driver‟s condition based on the real driving test cases. A specially designed hardware consisting of sensors and a mobile are installed in the vehicle. A program is installed in hardware and mobile phone. When a person is driving the vehicle sensor readings are compared to the real time test case values. If there is any presence of DUI of alcohol alert message will be sent.

- Sarkar et al [7] proposed “A Real Time Embedded System Application for Driver Drowsiness and Alcoholic Intoxication Detection”. This system uses embedded system. This system consists of 5 megapixel camera with embedded system board raspberry. Raspberry pi is interfaced with another arduino board which is used for some tasks like alarm notifications and ignition lock .It performs these tasks if and only if it receives a message from raspberry pi about the presence of alcohol.
- Savania et al [4] proposed “Alcohol Detection and Accident Prevention of Vehicle”. In this an alcohol sensor is placed in the vehicle to detect the alcohol. If the alcohol gases are detected then for every 5 minutes a message is sent to their relatives. In this an arm7 microcontroller is used and it is connected to GSM and GPS. The GPS is used to track the location of the vehicle and message will be sent using GSM module.
- Deshmukh et al [9] proposed “Driver fatigue Detection Using Sensor Network”. This system consists of sensors that are directly faced towards driver‟s face. This system monitors the driver eyes to check whether the driver is sleeping or not by eye blink sensor and detect their pulse from fingers by using LED and LDR. Analyze the sensor readings and find the fatigue level.
- In paper [12], the paper describes a real-time online prototype driver-weariness screen. It uses remotely found charge-coupled-gadget cameras which was equipped with dynamic infrared illuminators to get video images of the driver. Various visual cues that typically describe the level of alertness of a person are extricated in real time and systematically combined to gather the weakness level of the driver. In the event that the eye of driver is being continuously closing it mean eye-blink recurrence is beyond the normal state and it is in sleeping condition then start of the system would be off promptly.
- Kathiravan S et.al [13] introduces methods such as alcohol detection, heart beat rate observing system and personal recognizable proof system and discuss how they can be implemented to maintain a strategic distance from accidents.
- The report [1] says that annual average of 700,000 street accidents, 10 percentages happen in India which has overwhelmed China. The latest annual statistics revealed by the World Health Organization (WHO) in its first Global status report on street safety, 80,000 people are killed on Indian roads because of speeding, drunken driving, less usage of helmets, seat belts and tyke restraints in vehicles.
- Younsun Kim 2017 has proposed "Proof of concept of home IoT connected vehicles"-- The manner by which we cooperate with our autos is changing, driven by the

expanded utilization of cell phones, cloud-based administrations, and progressed car innovation. Specifically, the prerequisites and market interest for the Internet of Things (IoT) gadget associated vehicles will persistently increment. Furthermore, the advances in distributed computing and IoT have given a promising chance to creating vehicular programming and administrations in the car area. In this paper, we present the idea of a home IoT associated vehicle with a voice-based virtual personal aide included a vehicle operator and a home specialist. The proposed idea is assessed by actualizing a Smartphone connected with home IoT gadgets that are associated with an infotainment framework for the vehicle, a Smartphone-based characteristic dialect interface input gadget, and cloud-based home IoT gadgets for the home[15].

- Biometric scans can be optional. Finger-print, Palm-print and finger knuckle print can be incorporated for enhanced security [6]. Going a step ahead, face recognition algorithms can also be consolidated as an enhanced security feature. The present Paper [9] proposes the principal Component Analysis by face recognition. The authors in recommend Haar Transform for face feature extraction. Adaboost Technique is also proposed for face feature classification.
- The revolutionary algorithm for face detection, which combines both Haar Transform and Adaboost Technique, was proposed by Viola and Jones [13]. Further, the authors in propose that skin tone colour in RGB and Viola-Jones algorithm can be implemented for a better face detection and recognition approach. These techniques are excellent algorithms when face recognition has to be done irrespective of variations in background. On the other hand, these techniques are computationally expensive. Thus, situations where in the background can be plain simple image processing techniques would suffice the need. The paper deals with two face recognition algorithms that can be implemented where the background variations in minimum, as in the case of car, behind the driver in the car.
- In “A Real Time Embedded System Application for Driver Drowsiness and Alcoholic Intoxication Detection”[1], This work on the real time detection of car driver drowsiness and alcoholic intoxication. This detects large numbers of road accidents which takes place due to fatigue or alcohol drinking of driver. Computer vision and alcohol gas sensor application is combined to an embedded system to achieve this goal. This system consist of Drowsiness detection, alcoholic intoxication, Raspberry pi, Arduino UNO, Open CV and Embedded System.

- In [2], Design of ARM based face Recognition system using Open CV library", the authors have implemented a system using ARM7 based microcontroller and opencv based machine. This is interfaced to USB camera for continuous images are captured and these images are processed with help of Opencv and compared with existing database. If the current images are matching with any of the existing images the system generates command to the output unit to perform the location identification using GPS and forward the necessary information about the identified person using GSM/GPRS to concern authorities.
- In "Computer Vision System for Driver Fatigue Detection",[3] in this system can actively monitors driver vigilance level and alert the driver for any insecure driving condition. In that drowsiness detection of driver is based on viola jones algorithm for face and eyes detection. System is developed using video camera, Raspberry Pi hardware, and open source computer vision library (OpenCV) and Microsoft visual studio.
- In "Tracking Eye State for Fatigue Detection"[4] the author focuses on eye states tracking. Images are captured using a camera and used for tracking as input of the proposed method. In first step we use colour space for drivers' face detection and crop the face from background. In the next step, we estimate the area of the eyes and crop image from this region. Then top and bottom coordinates of the eyes are located using retrench the face pixels from this area and canny operator for edge detection. In the last step we count the number of white and black pixels and compare the distance between these coordinates for recognition of the driver's fatigue.
- In [8]"Advance Vehicle Control and Safety System Using Face Detection", the design is based on computer vision and embedded system application principles. System work is a combination of face detection, eye region detection and eye closing rate detection in real time environment. The proposed system is realized with a digital camera supported by embedded system board Raspberry Pi loaded with Raspian-OS and Python-IDLE with OpenCV installed. Also different vehicle control functions like center locking and unlocking, opening and closing of windows, bonnets etc. can be controlled by using Android mobile phone.

2.3 Project Feasibility Study

This project can be implemented using affordable electronic and software technology making it economically, technically and operationally feasible.

2.3.1 Economic Feasibility

This project is based on few electronic hardware components like Raspberry Pi, DC Motor, SIM808 module (GSM module + GPS module), Alcohol sensor (MQ3 sensor), Pi camera etc. which are affordable, making it economically feasible to implement. In this project we use the OpenCV, Raspbian OS, Python as software requirements which is open source, available freely and easily. All these parameters making it economically feasible to implement.

2.3.2 Technical Feasibility

This project is based on wireless technology and embedded system which are reasonably in phase with currently used technology. Therefore, it is very much favored by the technology.

2.3.3 Operational Feasibility

This system is user-friendly so that it will be pretty much operable by anyone without any experience. This could be helpful for police to detect alcohol consumed driver's location to take necessary actions. So, it is operationally feasible.

2.4 Project Timeline chart

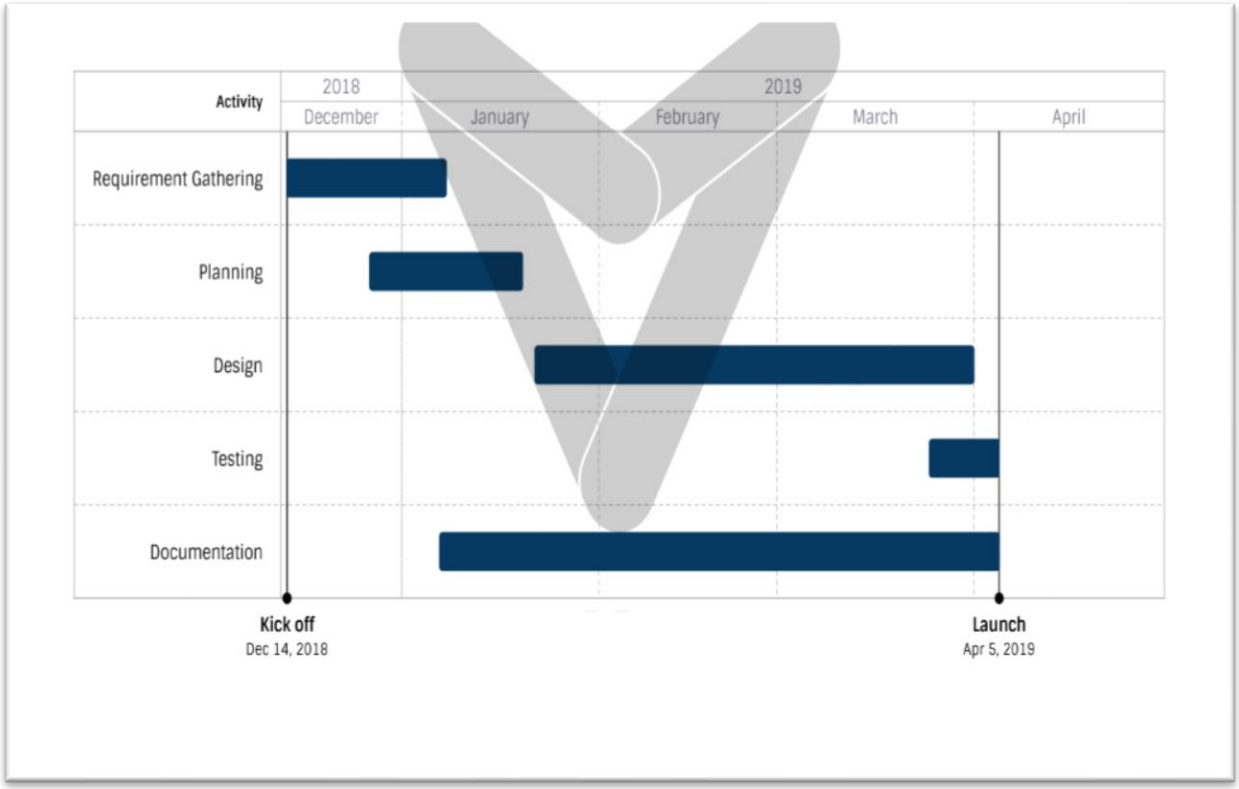


Figure 2.1: Project Timeline Chart

2.5 Detailed Modules Description

2.5.1 Interfacing with Raspberry Pi:

We have divided this module into two parts:

1) Configure the Raspberry pi for Programming

In this Part, we will setup the headless configuration of raspberry pi with our laptop or desktop.

The steps for headless setup of raspberry pi are following:

- Step 1: Write Raspbian OS image into SD card
  - Raspberry pi operates on the Raspbian Operating System.
  - So, we have to format the SD card (which have minimum size of 8GB) & flash the Raspbian OS in our SD Card.
  - We are using Raspbian Stretch OS in our project.

- Step 2: Boot Raspberry Pi
  - After inserting the SD card in raspberry pi, boot your pi using Ethernet Cable & Power cable connected to your laptop.
  - Find the IP address of your raspberry pi using your router's IP allocation table.
- Step 3: Login to your Pi using SSH client.
  - We have used the PuTTy Software, which acts as our SSH client.
  - Use the IP address of your pi, in order to start to the SSH client.
  - After that, command prompt of raspberry pi will pop up, which will ask for the login credentials.
  - After successfully logging in, you can use Raspberry pi for programming.
  - We can also use software like VNCViewer, to use the GUI of Raspberry Pi.

2) Connect the Alcohol sensor with Raspberry pi.

In this Part, we will retrieve the alcohol concentrations in the air, in the unit of mg/L, using MQ3 Alcohol Sensor.

- The MQ3 Alcohol sensor is an "Analog Sensor", which gives us the alcohol concentration present in the Air.
- But, Raspberry Pi only have the digital GPIO pins.
- So, in order to get the alcohol concentration values, we have to connect the "Analog to Digital Converter-ADC".
- This ADC will convert the analog values from sensor into 8 bit digital values.
- We are using PCF8591 ADC.

2.5.2 Controlling the DC Motor:

In this module, we will connect the DC motor as the prototype for the car engine. If the alcohol is detected then, we will immediately stop the DC Motor.

- The alcohol concentration present in the Air can be analyzed.
- For example, we have considered that the threshold value is to be 2.5 milligram/liter.

- Let us assume that initially, DC motor is rotating properly. If alcohol concentration increases above threshold value then DC motor stops.
- Alcohol sensor MQ3 continuously senses the concentration of Alcohol present in the air, if it decreases below threshold value then DC motor starts automatically.
- If DC Motor is initially not rotating then it will start if and only if alcohol concentration is below threshold value.

2.5.3 Interfacing GSM & GPS with Raspberry Pi:

In this module, we will configure the GPS module to send the location Coordinates. While, we are using the GSM module to enabling the SMS based services.

- In this module, we will configure the SIM808 module with Raspberry Pi for GSM and GPS.
- GSM module is used to send notification in the form of SMS to the family member of the driver or police.
- GPS module is used to send the real time location Coordinates of the driver.
- If alcohol molecules cross the fixed threshold value(for our project, it is 2.5 mg/L), the system will fetch the location of driver with the help of GPS module and send a warning text as well as car location via SMS to family member of the driver or police with the help of GSM module.

2.5.4 Anti Theft Module:

- In this module, our system will check whether the car is inside fixed area or not. In our project, radius is 5 kilometers.
- If the car is not in specified area, then location of car will be sent to the car owner via SMS with the help of a SIM808 module(i.e., GSM + GPS module).
- With the help of this module we can provide a greater level of security and provide the anti theft feature for the car.

2.5.5 Image Processing Module:

- In this module, we are going to capture the video stream of the driver using Pi camera.
- Libraries in python such as OpenCV, Dlib, Numpy and Scipy are used as our technology stack.

- So, after getting the driver's video frame, we will capture it and convert the frame into the grayscale to apply our algorithm.
- After that, we will detect the face of the driver using the "dlib frontal face detection algorithm".
- This algorithm will determine the facial landmarks and will give 68(x,y) coordinates of the specific face regions.

2.5.6 Eye Detection and Driver Alertness Module:

- After getting the coordinates of the specific face regions, we will get the coordinates only for the eyes.
- now we will use Eye Aspect Ratio(EAR), to determine whether the eye is closed or not.
- EAR is the ratio of distances between the vertical eye landmarks and horizontal eye landmarks.
- If the EAR is gone below the threshold value, then the eye is close.
- We will check whether the eyes is closed for 3 consecutive seconds or not.
- If the above condition is true, then we will play the buzzer, in order to awaken the Driver.

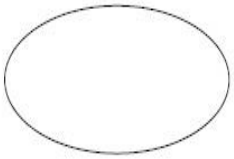
Chapter 3: System Design

3.1 Design principles:

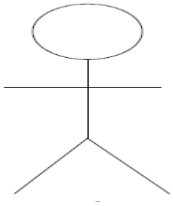
Ease of use: IoT based alcohol detection & accident prevention system's design should be in such a way that any user with little or no knowledge of IoT can use this system very easily and effectively.

3.2 Use Case Diagram:

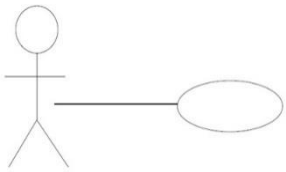
A use case specifies the behaviour of a system or a part of a system, and is a description of a set of sequences of actions, including variants, that a system performs to yield an observable result of value to an actor.



A use case is rendered as an ellipse in a use case diagram. A use case is always labelled with its name.



An actor is rendered as a stick figure in a use case diagram. Each actor participates in one or more use cases.



Actors may be connected to use cases only by associations.

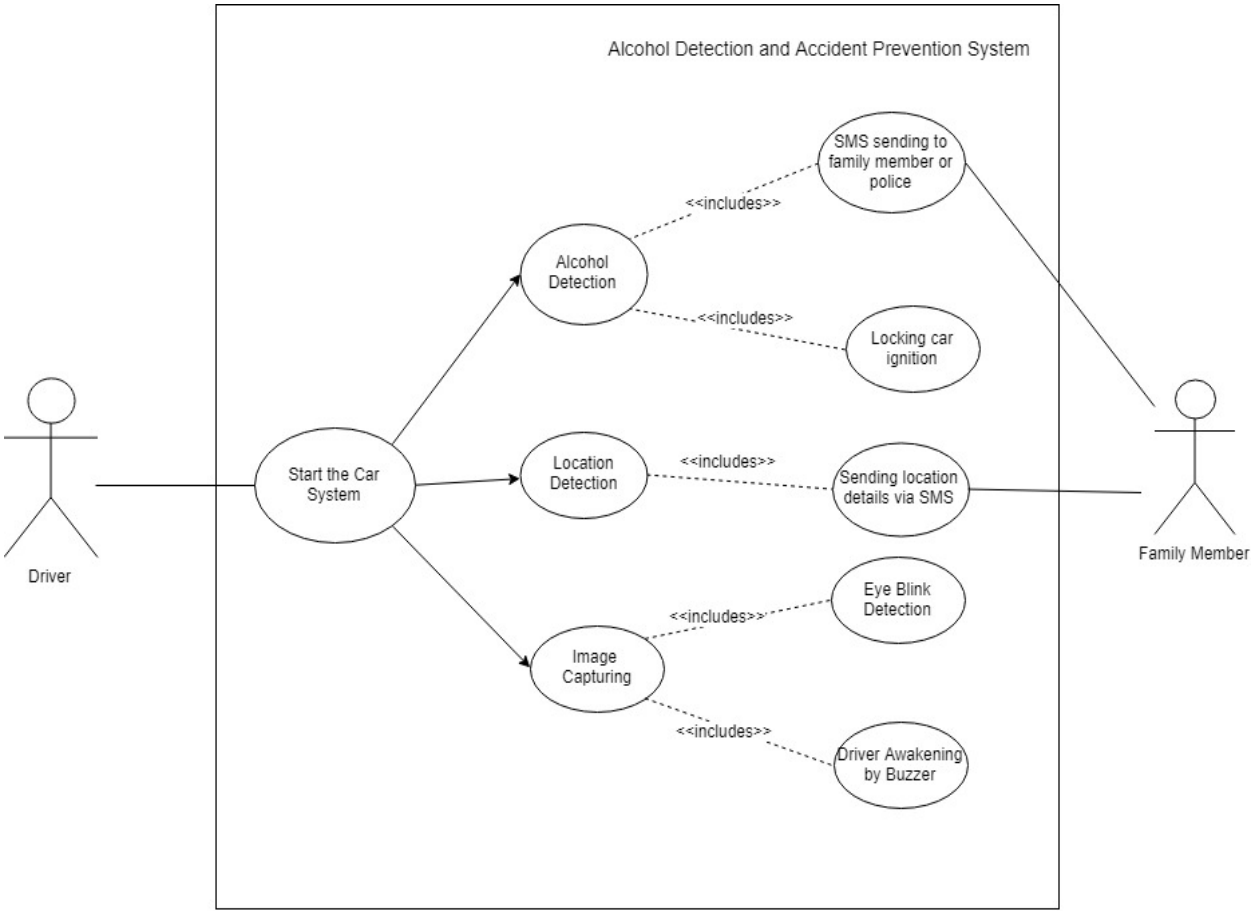
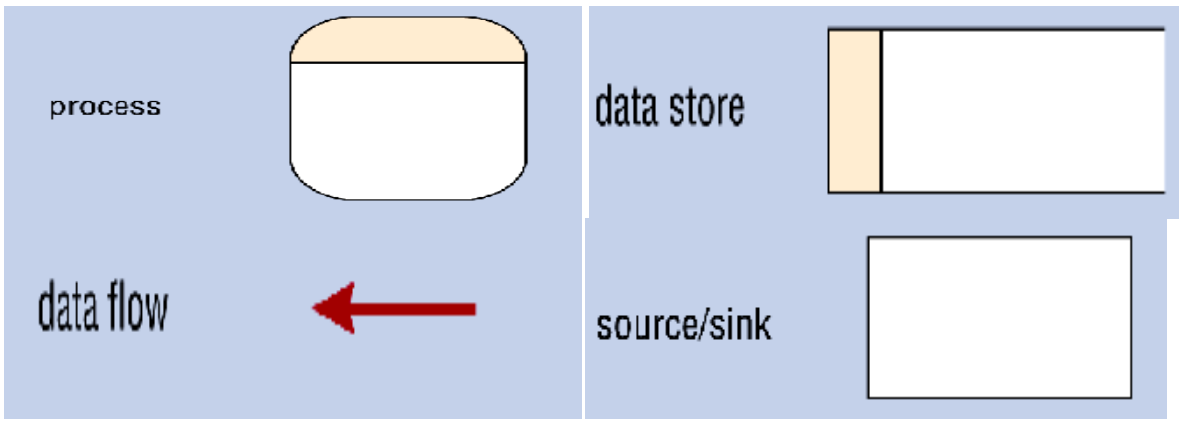


Figure 3.1: Use Case Diagram

3.3 Data Flow Diagram:

A diagram about the data flow between external agents (sources/sinks) and the processes and data stores within a system.



Level 0 Diagram: An overview of an organizational system that shows the system boundary, sources/sinks that interact with the system, and the major information flows between the entities and the system.

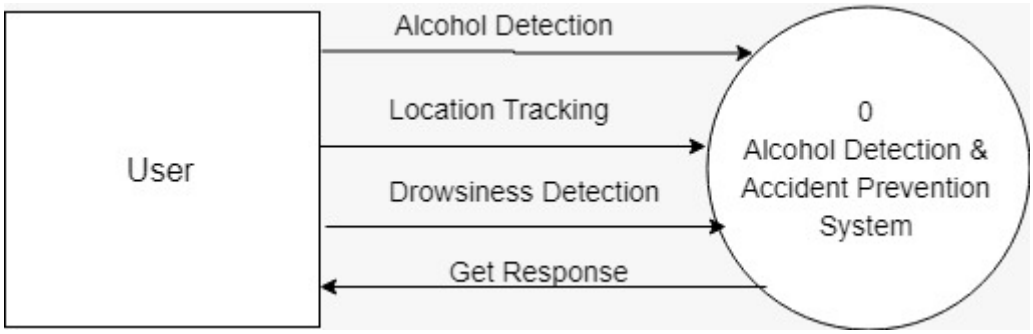


Figure 3.2: Level-0 DFD Diagram

Level 1 Diagram: A DFD that represents the primary functional processes in the system at the highest possible level.

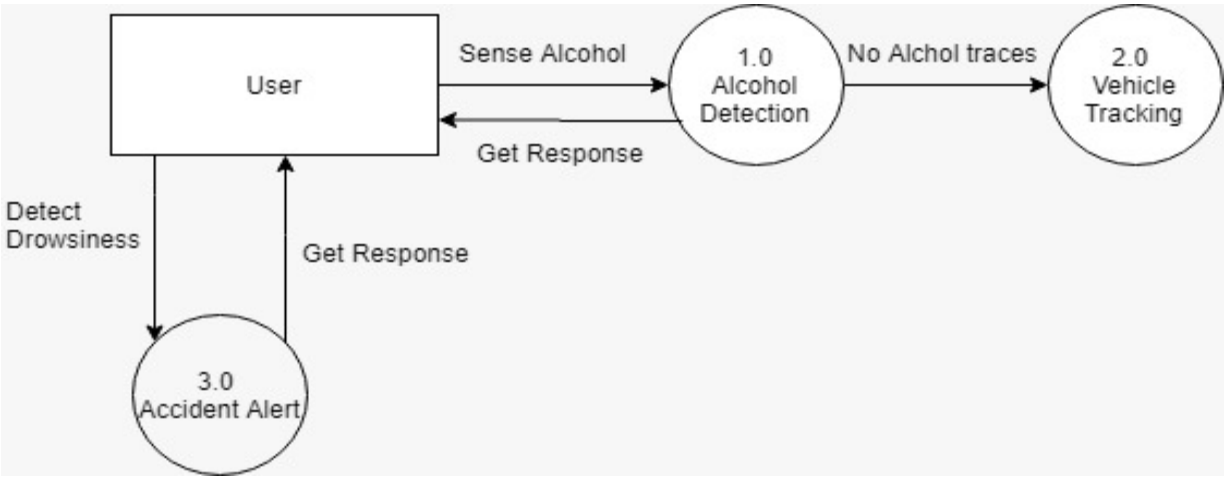


Figure 3.3: Level-1 DFD Diagram

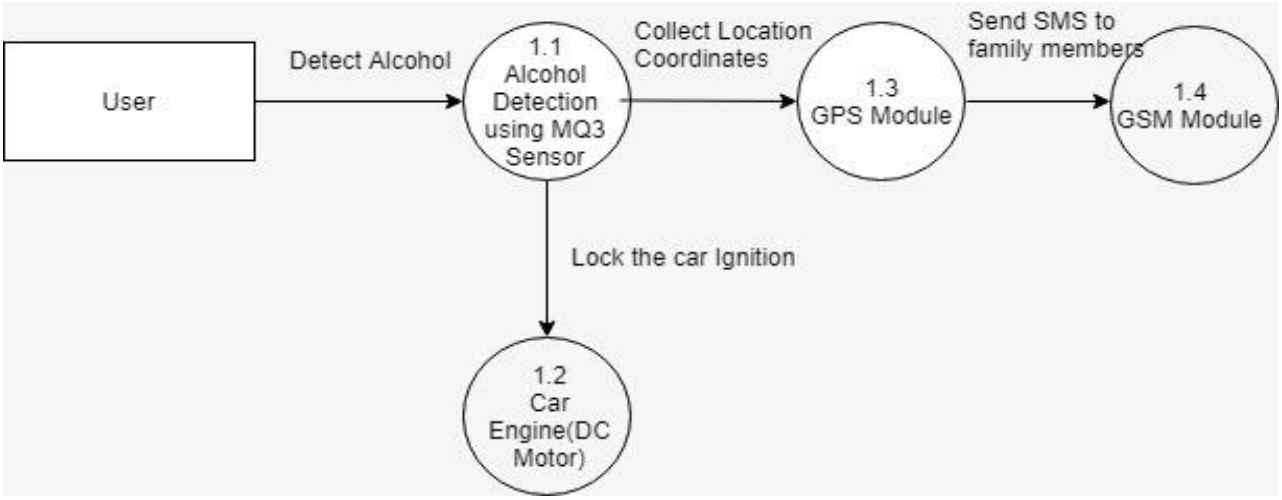


Figure 3.4: Level-2 DFD Diagram (For Alcohol Sensing)

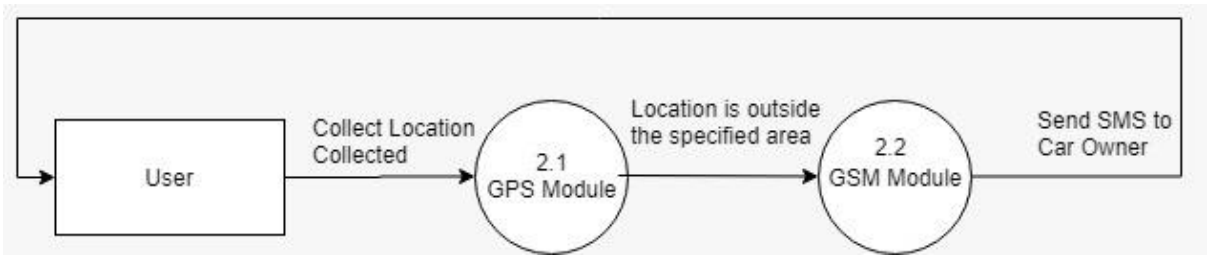


Figure 3.5: Level-2 DFD Diagram (For Anti-theft Detection)

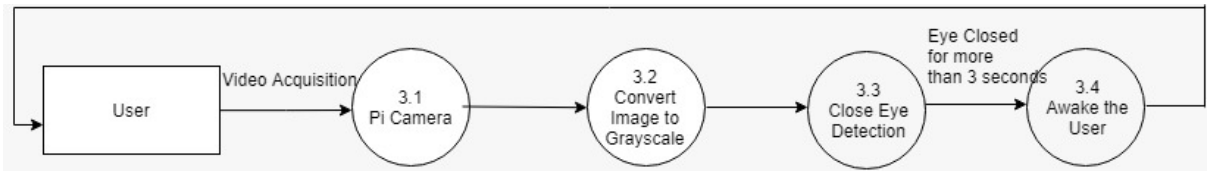


Figure 3.6: Level-2 DFD Diagram (For Drowsiness Detection)

3.4 Sequence Diagram:

A sequence diagram shows, as parallel vertical lines, different processes or objects that live simultaneously, and, as horizontal arrows, the messages exchanged between them, in the order in which they occur.

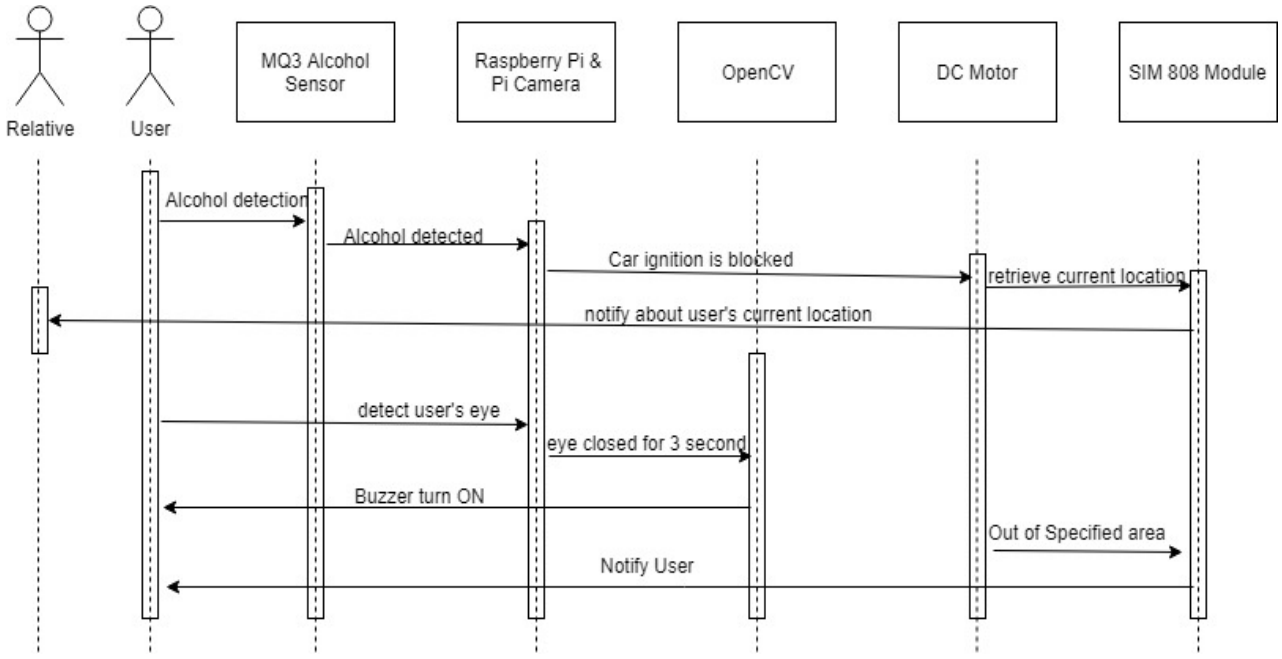
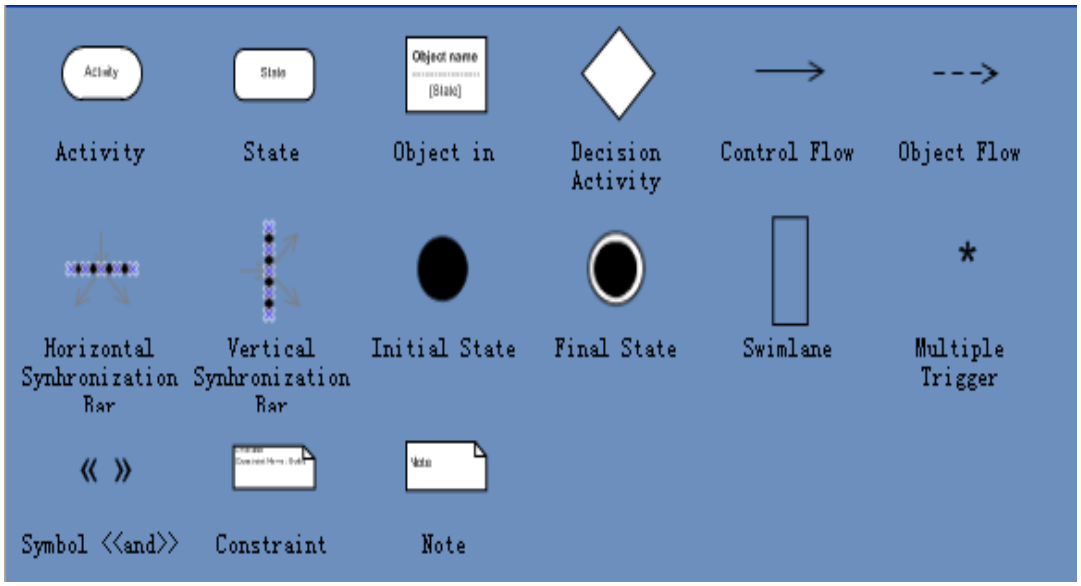


Figure 3.7: Sequence Diagram

3.5 Activity Diagram:

Activity diagram is basically a flowchart to represent the flow from one activity to another activity. The activity can be described as an operation of the system. The control flow is drawn from one operation to another.

Activity Diagram Symbols:



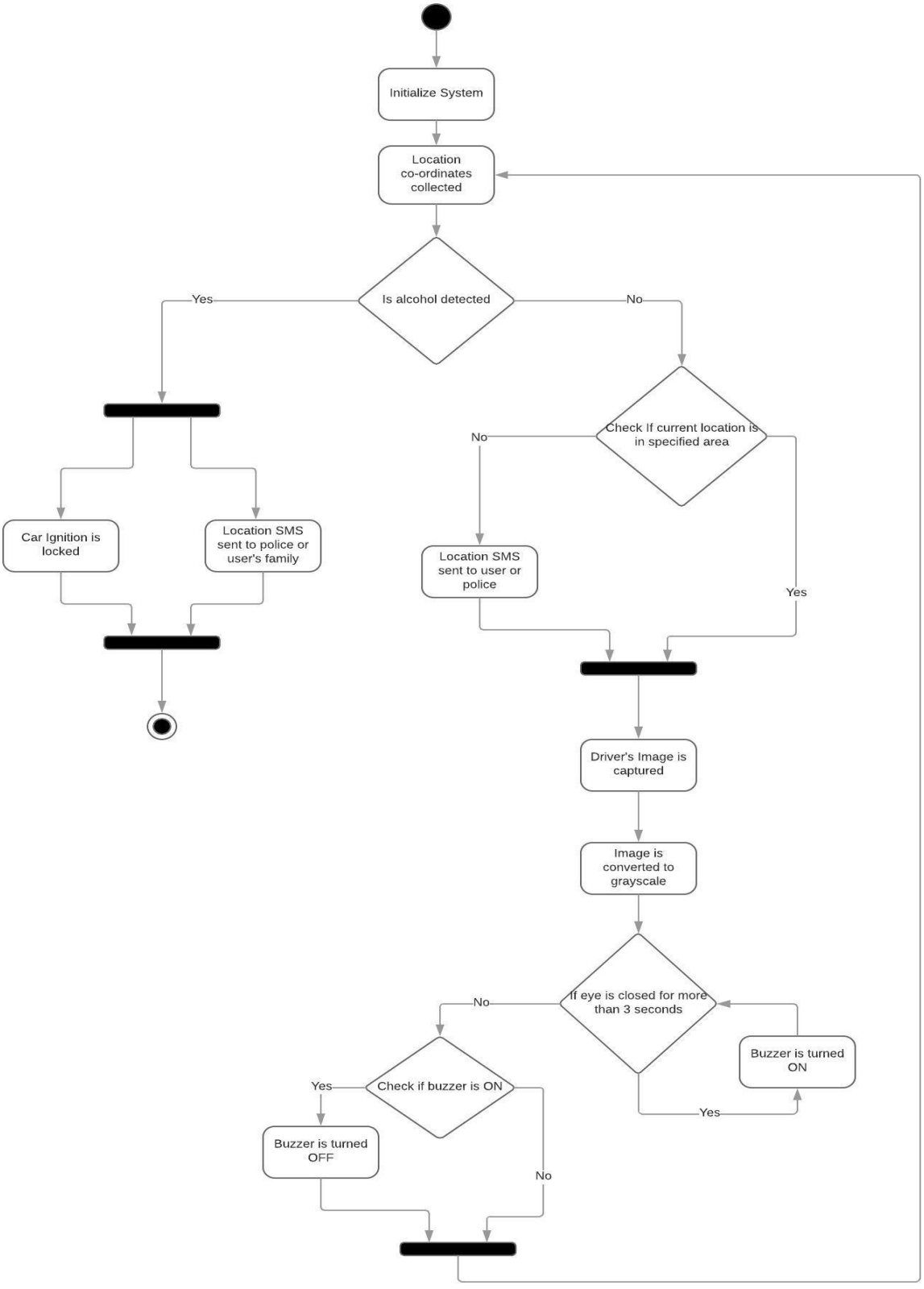


Figure 3.8: Activity Diagram

Chapter:4 Implementation and Testing

4.1 User Interface and Screenshot:

4.1.1 Alert SMS after Alcohol Detection:

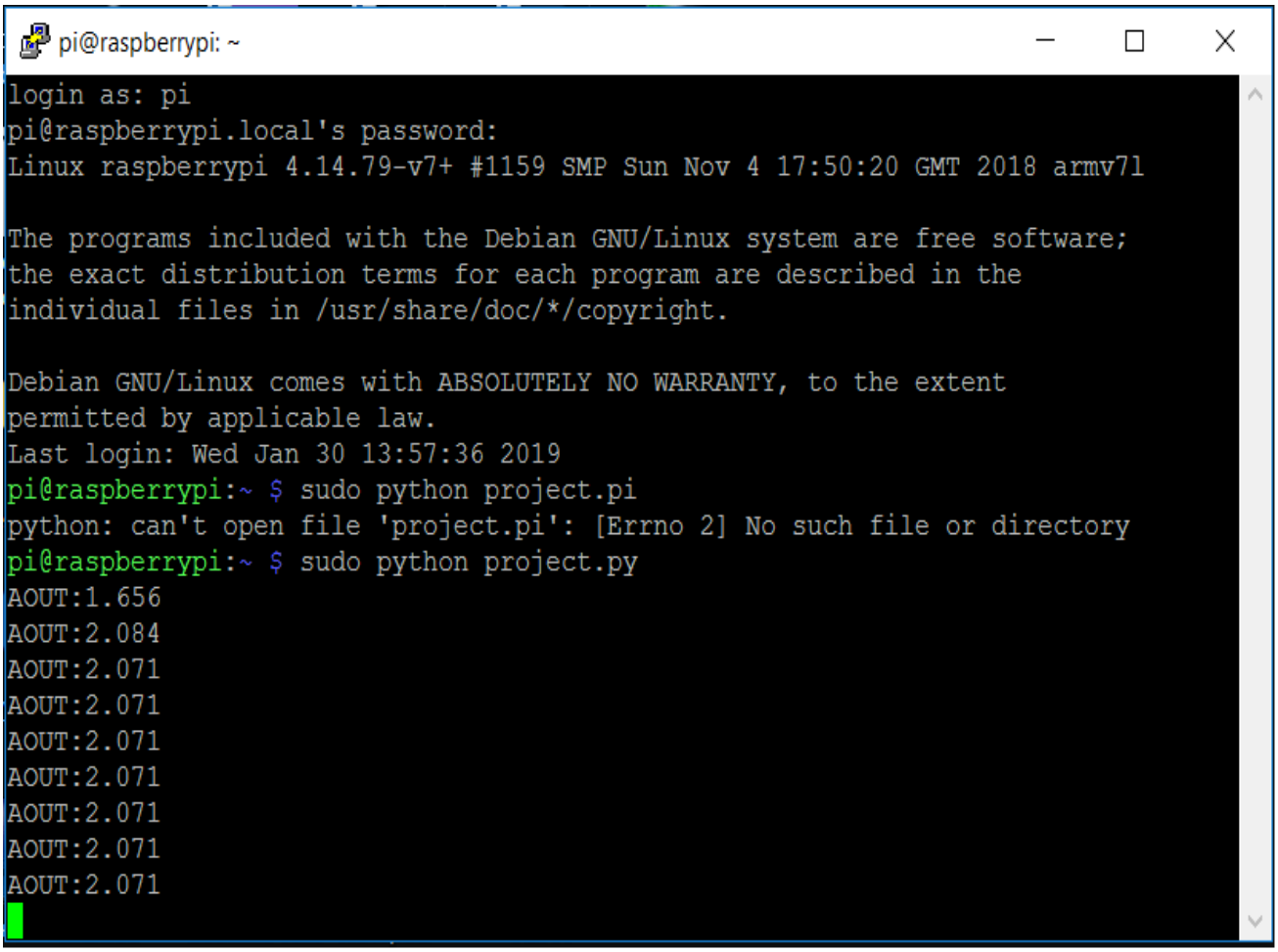


Figure 4.1: Screenshot of Alcohol Concentration

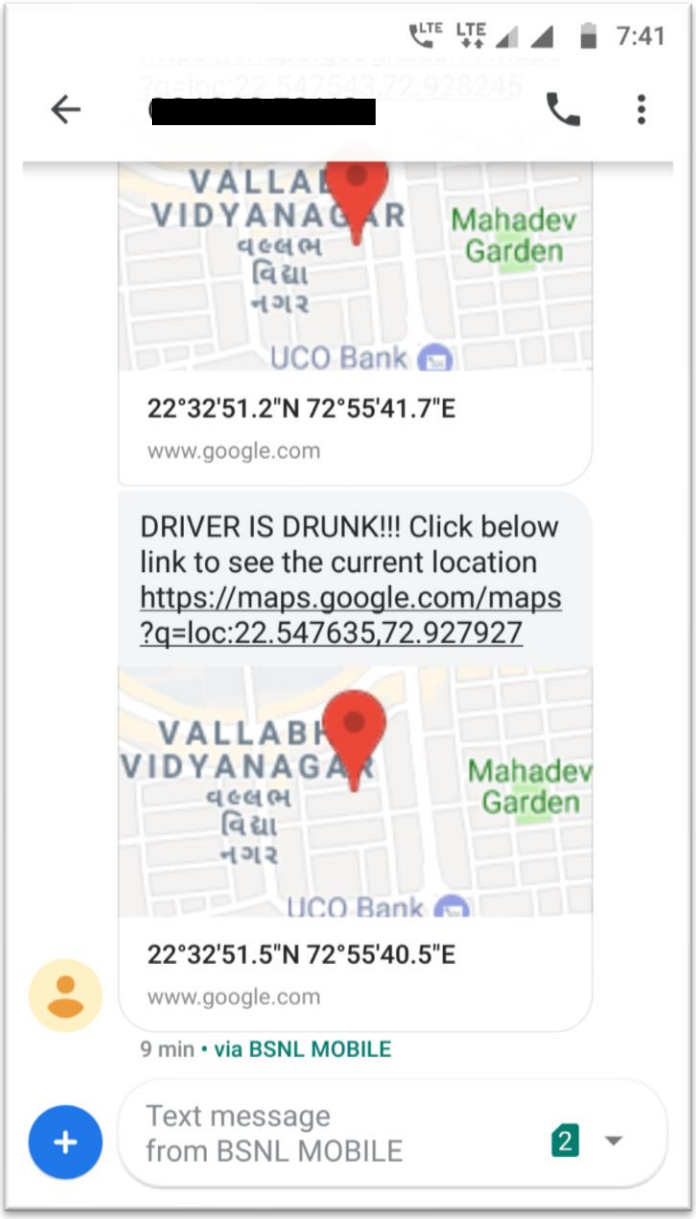


Figure 4.2: Screenshot of SMS based on Alcohol Detection

- Above figure shows the screenshot of SMS, that is automatically sent by the system.
- At the time of starting the car, the system checks for the Alcohol detection.
- If the Alcohol is detected, then the car ignition is locked.
- Furthermore, the system will detect the Real time GPS(Global Positioning System) coordinates of the car, to know the current location of driver.
- These coordinates are attached with the Google Map, so that driver can be tracked easily.
- Along with this coordinates SMS will be sent to either Family members of the driver/ Police, to ensure the safety of the driver.

4.1.2 Alert SMS for Anti-Theft Module:

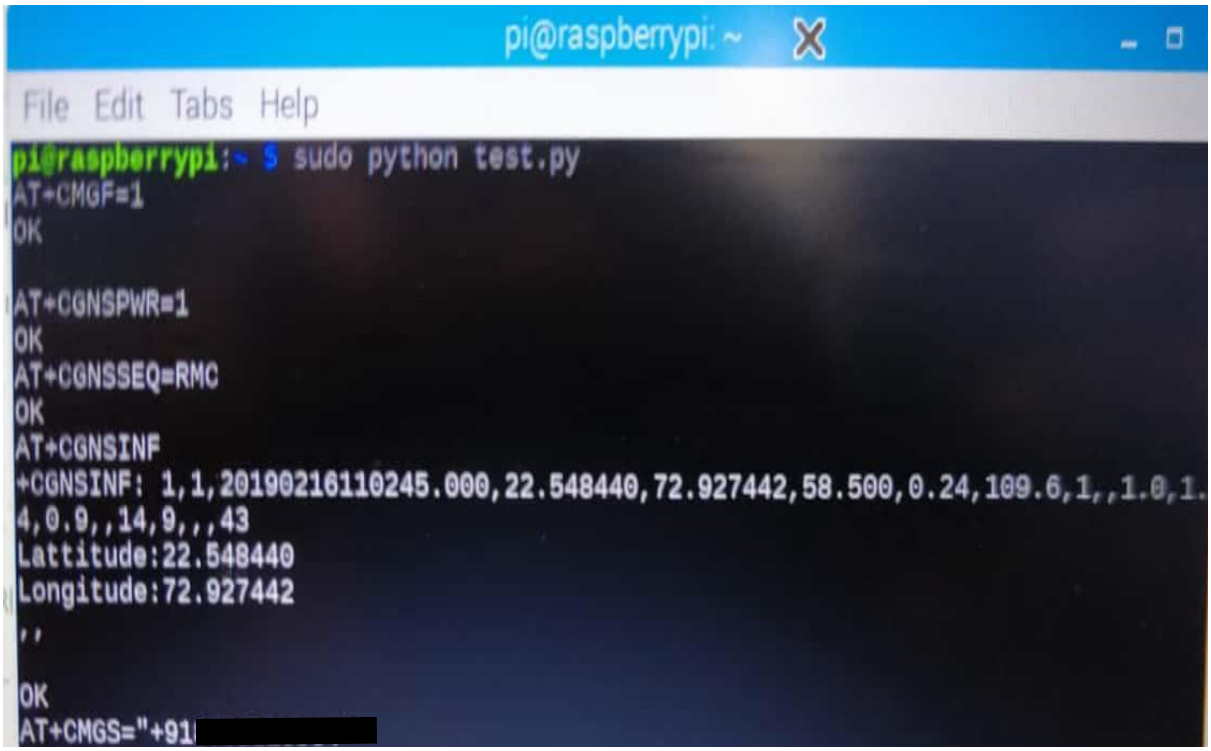


Figure 4.3: Screenshot of Location Coordinate

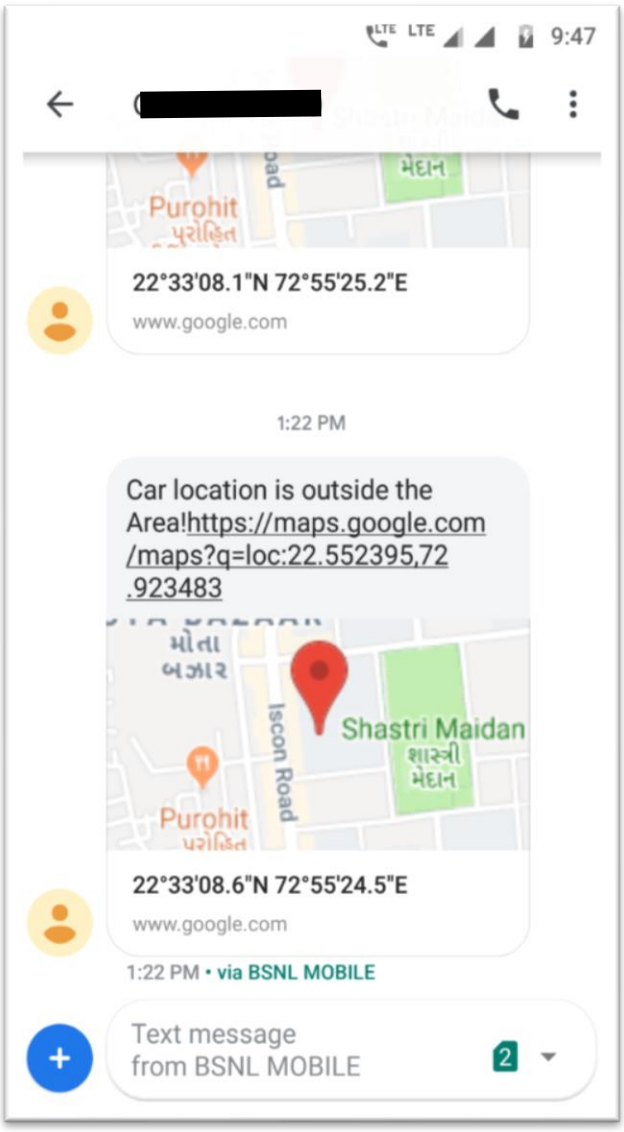


Figure 4.4: Screenshot of SMS for Anti-Theft Feature

- Above figure shows screenshot of SMS based on the result of Anti-Theft Module.
- Anti-Theft Module will check whether the car is in the specified area or not.
- If the car is outside the specified area, then the system will send the SMS along with the real time GPS Coordinates, to acknowledge the user about the car position.
- This facility is provided in order to ensure the security of the user's vehicle.

4.1.3 Real Time Drowsiness Detection:

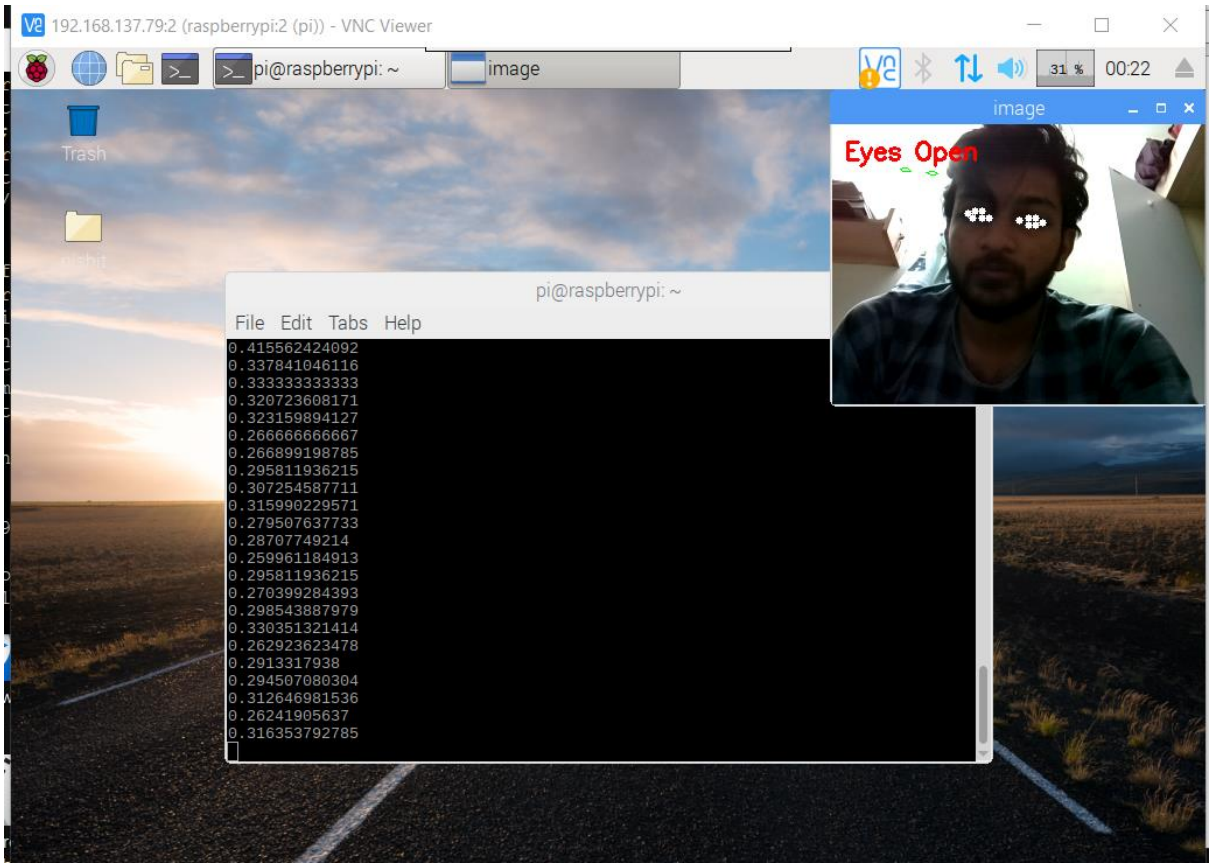


Figure 4.5: Eye detection for Drowsiness Detection(Eye open)

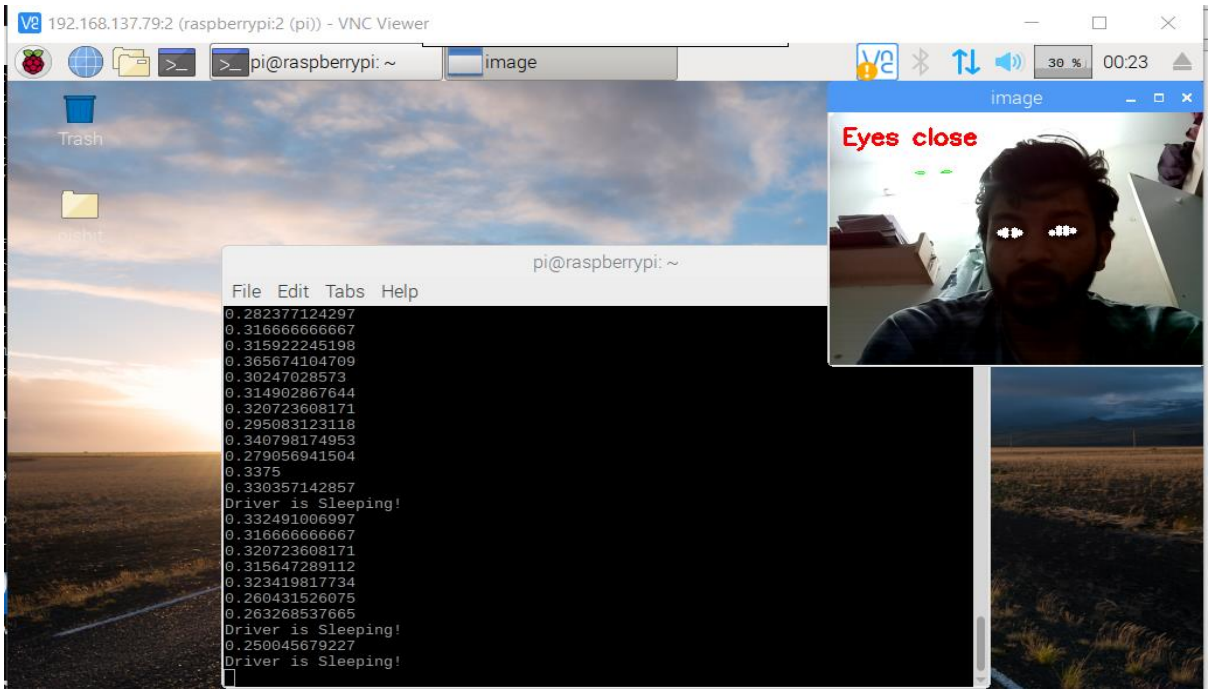


Figure 4.6: Eye detection for Drowsiness Detection(Eye Close)

- Above figure shows the GUI for the Drowsiness detection, which is achieved by means of Pi Camera.
- The Pi camera will continuously taking the video frames.
- Then our face detection algorithm will check whether the driver's eyes are open or closed.
- In the above figure, the values are nothing but the Eye Aspect Ratio(EAR), which is used for deciding the drowsiness of driver.
- If the Driver's both eyes are closed for consecutively 3 seconds, then we can take inference that driver must be drowsy.
- So, to avoid any unwanted event like Accident of car, we will awaken the driver using buzzer.

4.2 Testing using Test Cases:

Test Case Id	Test Scenario	Test Steps	Test Data	Expected Results	Actual Results
TU01	Check the presence of alcohol inside the car.	1. Get the Alcohol values from Alcohol Sensors.	No Data Required	Lock the Car Ignition, send the SMS of Real time location of car & turn ON the buzzer	As expected
TU02	Check if the car is outside the specified Region.	1. Get the location coordinates from the GPS Module.	No Data Required	SMS of the current location is shared with the car owner.	As expected
TU03	Check if the car is inside the specified	1. Get the location coordinates from the GPS Module.	No Data Required	No action.	As expected

	Region.				
TU04	Check if eye closed for greater than 3 seconds with spectacles or glass.	1. Uses looks at the Pi Camera.	No Data Required	Turn on the buzzer.	As expected
TU05	Check if eye closed for greater than 3 seconds without spectacles or glass.	1. Uses looks at the Pi Camera.	No Data Required	Turn on the buzzer.	As expected

Table 4.1: Testing using Test Cases

Chapter:5 Conclusion and Future Work

5.1 Conclusion:

- In this project, we proposed a method to sense the presence of alcohol from the breath of drivers and curtail the catastrophic effects it can have on peoples' lives.
- The system was designed and implemented successfully via the use of Raspberry Pi microcontroller, MQ-3 sensor, SIM 808 and Pi camera.
- Experimental evaluation of the system showed that the alcohol sensor was able to deliver fast response when alcohol is detected.
- Also, the ability of pi camera to detect drowsiness is a feature of the proposed system.
- We learned many skills such as wiring the circuit and tools that we used for this project like Raspbian OS, Open CV, DLib, etc. We were able to work together as a team during this project.

5.2 Future Work:

Using this system as framework, the system can be expanded to various other options which could include

- The next step would be to improve efficiency of this system and provide higher security.
- We can use OV5647 IR-Cut camera with Raspberry Pi which is Day-Night Mode Switching Camera. It will help to capture image at night is well.
- We can enhance this project by adding LCD Screen in car which displays status of alcohol detection sensor.
- An Android application can be developed which provides live location of car for higher security purpose.

References

[1] Altaf SV, Abhinay S, Ansari E, Kaunain Md, Anwer R. Alcohol Detection and Motor Locking System. International Journal of Advanced Research in Electrical, Electronics and Instrumentation Engineering. 2017; 6(2): 989-993.

[2] Kousikan M, Sundaraj M. Automatic Drunken Drive Prevention System. International Journal of Students Research in Technology and Management. 2014; 2(2): 75-77.

[3] Bhuta P, Desai K, Keni A. Alcohol Detection and Vehicle Controlling. International Journal of Engineering Trends and Applications. 2015; 2(2): 92-97.

[4] Shafi S., Tanmay NTS, Tarunya D, Vinay G, Reena K. Automatic Vehicle Engine Locking Control System to Prevent Drunken Driving using Virtual Instrumentation. International Journal of Engineering and Technical Research. 2016; 5(1):76-79.

[5] Articles base directory [online] 2011 Feb. 16 Available from: URL: http://www.dwworld.de/dw/article/0,,55 19345,00.html.

[6] Mandalkar RB, Pandore RN, Shinde MB, Godse VD. Alcohol Detection and Accident Avoidance using Locking with Tracking. International Journal of Advanced Research in Computer Science and Management Studies. 2015; 3(9): 142-147.

[7] Jay D. Fuletra, BulariBosamia: A Survey On Driver's Drowsiness Detection Techniques presented at IJRITCC in November 2013.

[8] P. H. Kulkarni, R. Wafgaonkar, S, S. Gujarathi, G. Ahirrao, "Alcohol Detection and Automatic Drunken Drive Avoiding," Int. Journal of Engineering Research and Applications, vol. 4, no. 2, April 2104, pp 21-24.

[9] K. Sakakibara, T. Taguchi, A. Nakashima and T. Wakita, "Development of a New Breath Alcohol Detector Without Mouthpiece to Prevent Alcohol-impaired Driving", Proceeding, IEEE International Conference on Vehicular Electronics and Safety, Sept. 2008, Columbus, OH, USA, pp 22-24.

[10] P. Baskett, Y. Shang, M. V. Patterson, T. Trull, "Towards A System for Body-Area Sensing and Detection of Alcohol Craving and Mood Dysregulation", Proceeding, IEEE Conference on Consumer, Communication and Networking, 2013, Las Vegas, USA, pp 15-19.

[11] L. A. Navarro, M. A. Diño, E. Joson, R. Anacan and R. D. Cruz, "Design of Alcohol Detection System for Car Users thru Iris Recognition Pattern Using Wavelet Transform", Proceeding, 7th IEEE International Conference on Intelligent Systems, Modelling and Simulation, 25-27 Jan. 2016, Bangkok, Thailand.

[12] V. Savania, H. Agravata and D. Patel, "Alcohol Detection and Accident Prevention of Vehicle", International Journal of Innovative and Emerging Research in Engineering, vol. 2, no. 3, 2015, pp 52-58.

[13] S. Chauhan, "GSM Based Alcohol Detection for Vehicles", International Journal of Research in Advanced Engineering and Technology, vol. 2, no. 6, November 2016, pp 23-25.

[14] M. Vaishnavi, V. Umadevi, Y. Bhaskar Rao, S, Pavithra, "Intelligent Alcohol Detection System for Car", International Journal of Scientific and Engineering Research, vol. 05, no.11, Nov 2014.

[15] Marco Javier Flores • José María Armingol • Arturo de la Escalera.: Real-Time Warning System for Driver Drowsiness Using Visual Information. In: Springer Science + Business Media B.V. 2009.