Drowsiness Detection System using Machine Learning

Project report in
Computer Application

Submitted to
Goa University

Project By
Mr. Ashvin Arolkar
Mr. Diraj Dinesh Naik
Mr. Ganesh Gogare
Mr. H. Fayaz
Mr. Jolvin Dias
Mr. Joshua Rebello
Mr. Vistar Shikhre

THIRD YEAR BACHELORS OF COMPUTER APPLICATIONS 2022-2023

Under the Guidance of
Asst. Prof. Tracy Almeida

Rosary College Of Commerce and Arts
Navelim-Salcete Goa

DECLARATION

We declare that this project entitled “Drowsiness detection system using Machine Learning” has been done by us and to the best knowledge; it has not previously formed the basis for the award of any diploma or degree by this or any other University.

Name	Roll No	Signature
Mr. Ashvin Arolkar	R/BCA-20-105	
Mr. Diraj Dinesh Naik	R/BCA-20-108	
Mr. Ganesh Gogare	R/BCA-20-114	
Mr. H. Fayaz	R/BCA-20-117	
Mr. Jolvin Dias	R/BCA-20-124	
Mr. Joshua Rebello	R/BCA-20-125	
Mr. Vistar Shikhre	R/BCA-20-142	

Date:

Place: Navelim

CERTIFICATE

Certified that this report entitled "Drowsiness Detection system using Machine Learning" is a record of work done by the candidates themselves under my guidance during the project of study and that to the best of my knowledge, it has not previously formed the basis of the award of any diploma by this or any other university.

Asst. Prof Tracy Almeida
Project Guide

Certified that the project entitled "Drowsiness Detection system using Machine Learning" been undertaken by the students during the academic year 2022-2023 in the laboratory of this college.

Asst. Prof Tracy Almeida	Prof. Helic M. Barretto
Project Coordinator	**Principal**

Examined the project entitled "Drowsiness Detection system using Machine Learning" during the academic year 2022-2023.

Examiner

ACKNOWLEDGEMENT

We thank the almighty for giving us the courage and perseverance in completing our project. This project itself is an acknowledgment to all those people who have given us their heartfelt cooperation and support.

We would like to thank our Principal, Prof. Helic M. Barretto and the Administrator Rev. Fr. Gabriel Coutinho for providing us with the necessary resources and infrastructure to carry out our project. We are grateful for the opportunities and support provided by the college, which have helped us to develop our skills and knowledge.

Special, thanks to our Programme Coordinator as well as our Project Guide, Asst. Prof Tracy Almeida, for her invaluable guidance and support throughout the project. Her expertise, insights, and encouragement were instrumental in our success.

We would also like to thank the faculty members of our department for their continuous support and encouragement. Their feedback and suggestions were essential in shaping our project and enhancing its quality.

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Last but not the least, we would like to express our deep sense of gratitude and earnest thanks to our dearest parents for their moral support and heartfelt cooperation in doing the project.

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Chapter 1

SYSTEM ANALYSIS

System analysis is the process of observing systems for troubleshooting or development purposes. It is the collection of notations, methodologies, and tools used to gather details and analyse a problem situation prior to the system design and implementation.

In IT Project Management there are various processes done like study, design, development, implementation, support, or management of computer-based information systems particularly software applications and computer hardware.

To acquire data for the analysis of our project, we went through the various causes which lead to road accidents and the most common reason were the drivers driving while fatigued or under the influence of alcohol. So, these were some of the causes which we thought can be fixed from our side.

We then studied the different products available to prevent drivers' drowsiness and we found that there were many existing products. But most of the products were inbuilt only available in expensive vehicles. Also, there are external products available to buy but it's too expensive and not available in our country. Hence, we proposed to implement a Drowsiness Detection System using Machine Learning.

To check the feasibility of the project we did a study on the different hardware components needed. We found that Raspberry Pi would be most suitable for our project. We had a period of seven months to complete the project and we estimated that we would be able to complete the system during this period.

1.1 Introduction

Driver fatigue has been the main issue for countless mishaps due to tiredness, tedious road condition, and unfavourable climate situations. Every year, the National Highway Traffic Safety Administration (NHTSA) and World Health Organisation (WHO) have reported that approximately 1.35 million people die due to vehicle crashes across the world. Generally, road accidents mostly occur due to inadequate way of driving. These situations arise if the driver is addicted to alcohol or in drowsiness. The maximum types of lethal accidents are recognized as a severe factor of tiredness of the driver. When drivers fall asleep, the control over the vehicle is lost.

So, we proposed a system to alert the driver on the condition of drowsiness or daydreaming. The proposed system is being integrated by a credit card-sized computer known as Raspberry Pi4 and a Pi camera that can trace eye movement, and a GSM module to forward an SMS to the registered contacts in it. The Pi camera monitors the driver’s eye blinking, eye closure, face detection, head posture, etc. with a face landmark algorithm. These characteristics help to measure driver fatigue and instantly alert him with the help of a voice speaker and forward an SMS to a person (owner of the vehicle) who can make him conscious. Also, if the driver has consumed alcohol, then it will be detected by the alcohol sensor and an SMS will be sent to the contacts in the GSM module.

1.2 Limitations of Existing System

After conducting a detailed analysis of the existing system, we found that most of the existing systems were inbuilt features that to only in expensive vehicles. Also, there are external products available to buy online but are very costly.

Some of the limitations of the existing system were:

- Only a limited number of expensive cars have the inbuilt facility of the drowsiness detection system.
- Internet Connectivity is the biggest limitation of this project
- It can’t measure basic physiological behaviour states like drunken driving and yawning.
- A security concern is always present whenever middleware cloud-based architecture is required.
- Experiments and evaluations of detecting driver fatigue have been done in a controlled environment.

1.3 Features of Proposed System

Due to the limitations in the existing system, we proposed to implement a project “Drowsiness Detection system using Machine Learning” which would be a one-stop solution for drivers driving while fatigued.

Commented [t1]:

The features of the proposed system are:

- **Implementation:**
  A simple application of image processing.

- **Warning:**
  Warns the driver of drowsiness and the risk of microsleep.

- **Avoid Crash**
  Compliances with driver warnings help to avoid crashes caused by fatigue

- **Yawn Detection**
  The pre-trained shape predictor in the dlib library is used to obtain 68 pixels in (x,y) coordinates of facial landmarks of a face.

- **Alcohol Detection**
  Alcohol detection can help identify drowsiness as it impairs cognitive and motor skills, leading to fatigue, and increases the risk of accidents and injuries.

- **SMS Alert**
  SMS alert in drowsiness detection can help prevent accidents and injuries by notifying drivers when their behaviour suggests they are drowsy or inattentive, improving road safety. The SMS is sent to 9 preloaded numbers using GSM (Global System for Mobile Communication).

Chapter 2

SYSTEM DESIGN

The drowsiness detection system using Raspberry Pi is a robust solution for ensuring driver safety, particularly in long-distance transportation. The system architecture involves the use of a camera to capture the driver's face, followed by facial detection and recognition algorithms to identify the driver's face. Eye detection and tracking algorithms are then applied to monitor the driver's eye movements and detect drowsiness. The system is implemented using Python programming language and various libraries such as OpenCV, TensorFlow, Dlib, and PiCamera. The system can trigger an alert with a buzzer, to warn the driver of drowsiness, prompting them to take corrective actions and avoid accidents.

The use of Raspberry Pi in the drowsiness detection system makes it a compact, and portable solution. Raspberry Pi is a small-sized, single-board computer that can run the necessary software and algorithms, making it ideal for use in a wide range of transportation systems. The system can be integrated into existing car systems, including GPS and in-car entertainment systems, to provide a more comprehensive safety solution. Additionally, the system can be extended to collect and analyse other data, such as vehicle speed, to improve the accuracy of the drowsiness detection system. Overall, the drowsiness detection system using Raspberry Pi is a reliable and cost-effective solution for enhancing driver safety in transportation systems.

2.1 Block Diagram

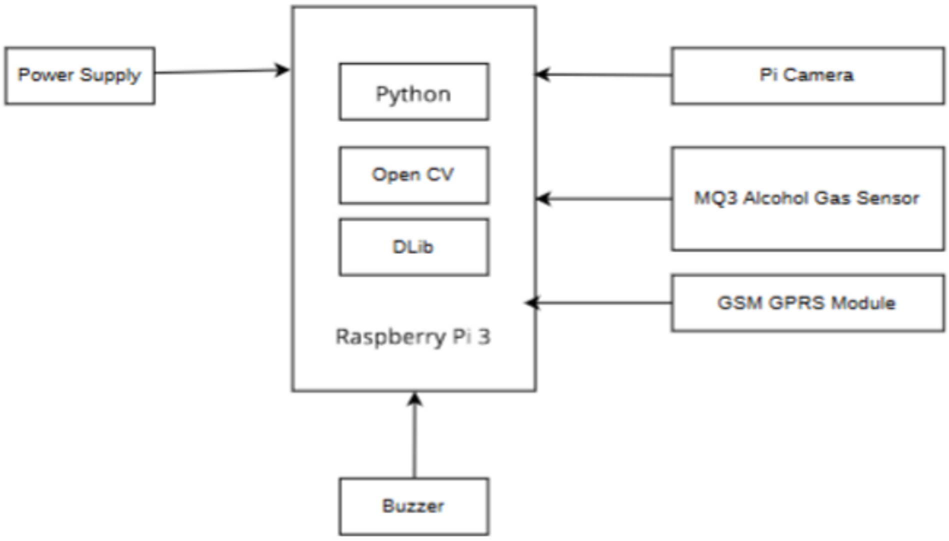


Figure 2.1 Block Diagram of Drowsiness Detection system using Machine Learning

2.2 Circuit Diagram

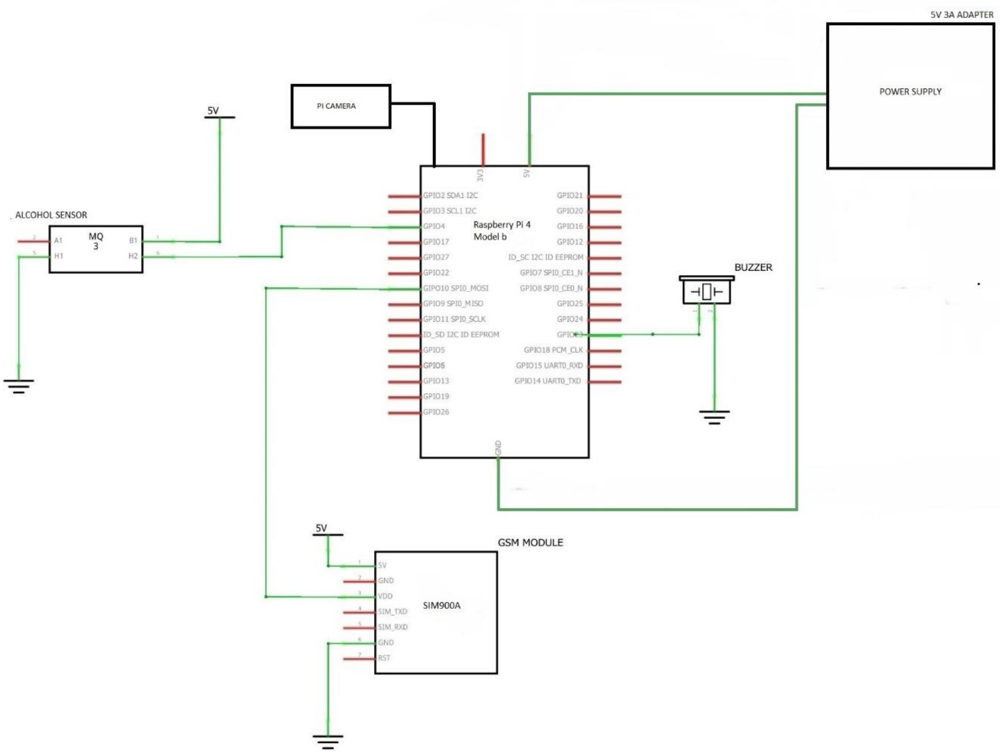


Figure 2.2 Circuit Diagram of Drowsiness Detection system using Machine Learning

2.3 Use Case Diagram

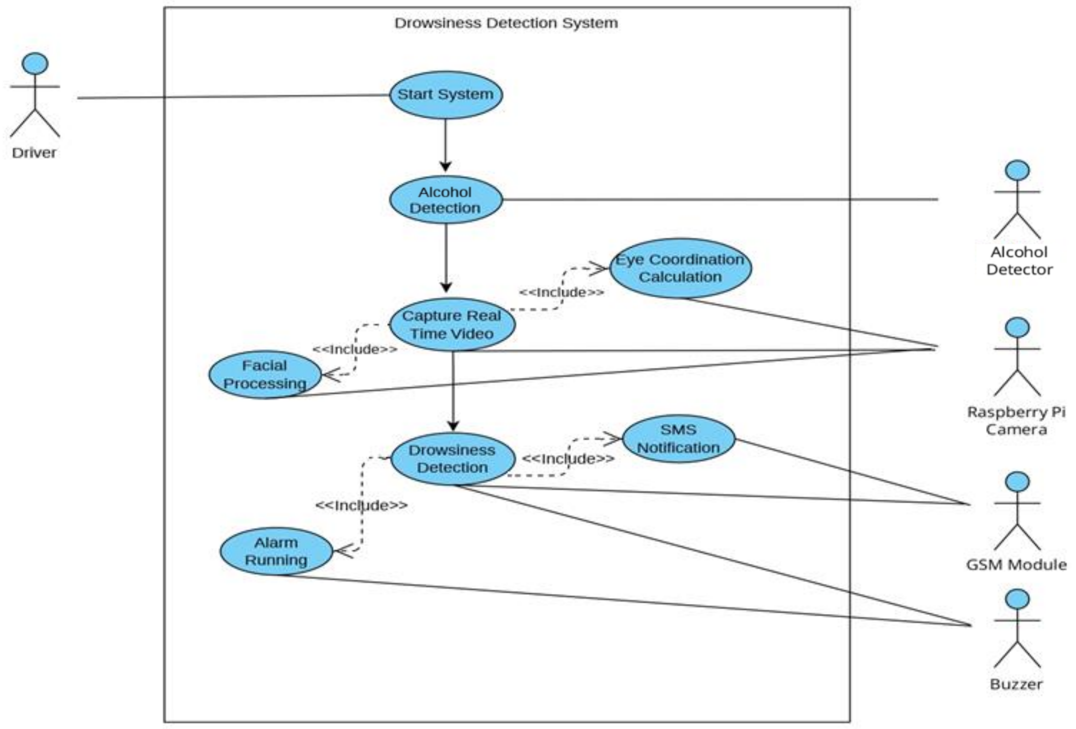


Figure 2.3 Use Case Diagram of Drowsiness Detection system using Machine Learning

2.4 Activity Diagram

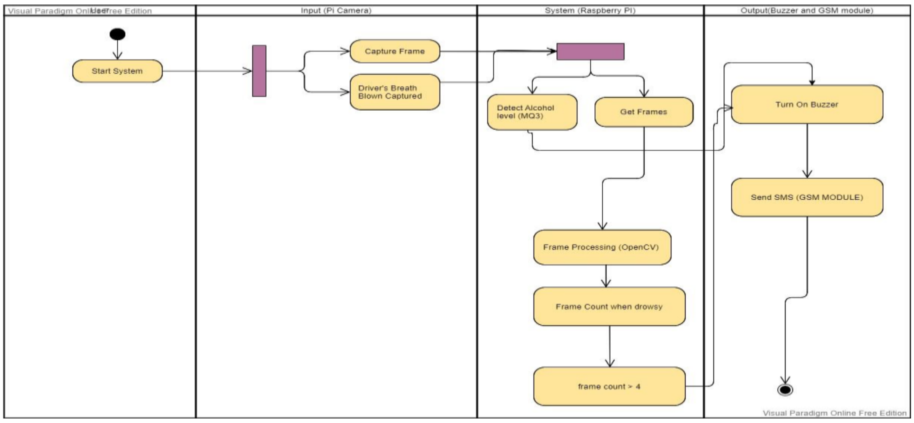

User
Input (Pi Camera)
System (Raspberry PI)
Output(Buzzer and GSM module)
Start System
Capture Frame
Driver's Breath Blown Captured
Detect Alcohol level (MQ3)
Get Frames
Frame Processing (OpenCV)
Frame Count when drowsy
frame count > 4
Turn On Buzzer
Send SMS (GSM MODULE)
Visual Paradigm Online Free Edition
Visual Paradigm Online Free Edition

Figure 2.4 Activity Diagram of Drowsiness Detection system using Machine Learning

Chapter 3

SYSTEM IMPLEMENTATION

3.1 HARDWARE TOOLS

3.1.1 Raspberry Pi 4

Raspberry Pi 4 is a **robust computing platform** that has been designed as a networked AI core. It can serve a variety of industrial applications including robotics, factory controllers and the electronics behind smart home hubs.

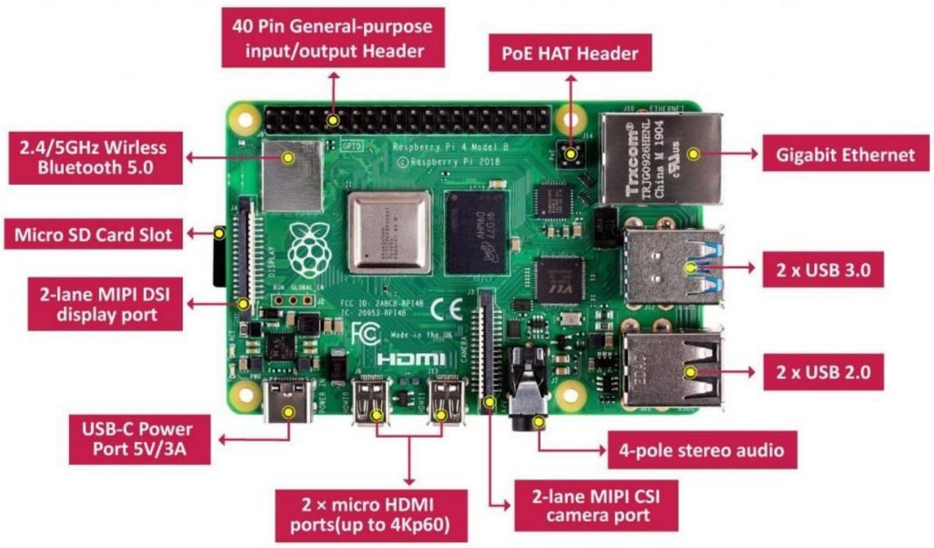

40 Pin General-purpose input/output Header
PoE HAT Header
2.4/5GHz Wirless Bluetooth 5.0
Gigabit Ethernet
Micro SD Card Slot
2 x USB 3.0
2-lane MIPI DSI display port
2 x USB 2.0
USB-C Power Port 5V/3A
4-pole stereo audio
2 × micro HDMI ports(up to 4Kp60)
2-lane MIPI CSI camera port

Figure 3.1.1 Raspberry Pi 4

Components of Raspberry Pi 4

1. **Micro-USB Power Supply:** A 5V micro-USB typically powers the Raspberry Pi. But how much current the Pi requires to function depends on your usage. The recommended amount is between 700mA for a Raspberry Pi Model A, and up to 2.5A for a Raspberry Pi 3 Model B. The Raspberry Pi boards typically draw much lower amounts, between 200 and 500mA Usage depends on what you're doing with the Pi. Playing videos and browsing the web draws more power than idling and booting. It also depends on what devices you have connected; some keyboards and mice draw more power than others.

2. **SD Card Slot:** Secure Digital Card slot (SD Card) slot is a solid-stale removable storage device that is required to run operating systems on Raspberry Pi as Raspberry Pi doesn't have any onboard memory and data storage functionality. Raspberry Pi supports both SDHC (Secure Digital High Capacity) and SDXC (Secure Digital Extended Capacity). The best-suited card for the proper running of all sorts of operating systems without any hiccup is Class 10 with speed @ 10MB/sec.

3. **USB Ports & Ethernet Port:**

USB Port: The number and type of USB ports on Raspberry Pi depend on the model. The Raspberry Pi Model B is equipped with two USB 2.0 ports; the B+, 2B, 3B and 3B+ have four USB 2.0 ports. The Pi 4 has two USB 2.0 ports and two USB 3.0 ports. In all models prior to the Pi 4, the USB ports connect to a combo hub/Ethernet chip, which is itself a USB device connected to the single upstream USB port on BCM2835. On the Pi 4, the USB hub chip is connected to the SoC using a PCIe bus. On the Model A and Zero range, the single USB 2.0 port is directly wired to the SoC.

Ethernet Port: In order to enable an Internet connection online and to update the software or to install lathe test packages from online repositories, Raspberry Pi supports Ethernet Connection. Raspberry Pi (Every Model) comprises of R145 Ethernet Jack which supports CATS/6 cables. It enables Raspberry Pi to be connected to Wireless Router, ADSL Model, or any other Internet connectivity sharing device.

4. HDMI (High-Definition Multimedia Interface): HDMI Port enables Raspberry Pi to be connected to HDTV via HDMI cable. Raspberry Pi supports maximum resolution of 1920x1200. With the help of HDMI Full HD MPEG-4 can be streamed via HDMI.

5. Video Out (RCA Cable): In addition to HDMI Connectivity which facilitates HD connection, Raspberry Pi also has a provision to be connected to a standard monitor or TV using an RCA video cable. RCA cable is less expensive as compared to HDMI but along with RCA cable, the user has to buy a 3.5mm stereo cable for audio facilitation. The Pi Model B+, Pi 2, Pi 3, and Pi 4 feature a 4-pole 3.5mm audio jack which also includes the composite video signal. This has allowed for the removal of the composite video socket found on the original Model B. The new jack is a 4-pole socket that carries both audio and video signals. It's similar to sockets found on other multimedia devices such as iPods, MP3 players, and smartphones. It is now used on the A+, B+, Pi 2, Pi 3 and Pi 4.

6. Status LEDs: Raspberry Pi comprise of 5 main LED's performing the following functions:

I. ACT: (Color-Green): The main function of ACT LED is to show card status. Normally flashing during any SD Card activity performed by the end user.

II. PWR (Color-Red): The main function of PWR led is power. This led is continuously ON when Raspberry Pi is switched on and keeps on till switched off.

III. FDX: (Color-Orange): The main function of FDX led is a full duplex. This Led is powered on when the Ethernet connection is of Full Duplex type.

IV. LNK: (Color- Orange): The function performed by LNK led is Link. This LED is powered on when the Ethernet connection is established and packet transfer starts taking place.

V. 100: (Color-Orange): The 100 Led objective is to show a 100 Mbps connection. When any connection is established at the Ethernet port, this LED only gets on when the connection is of 100 Mbps speed and gets powered off when the connection is at 10 Mbps.

7. **GPIO (General Purpose Input Output):** GPIO facilitates connecting all sorts of peripheral devices to Raspberry Pi. Raspberry Pi has onboard GPIO with 40 pins, 26 of which are used as digital inputs or outputs. More importantly, 9 of the 14 new GPIO pins are dedicated inputs/outputs, it also facilitates the onboard DART, I2C, SPI Bus and still a large amount of free GPIO pins are there for add-on attachments.

8. **CSI Camera Connector.** Raspberry Pi has a Mobile Industry Processor Interface (MIPI) Camera Serial Interface Type 2 (CSI-2). CSI-2 facilitates connection of small camera to Broadcom BCM 2835 processor. The function of this interface is to standardize the attachment of camera modules to the processors for the mobile phone industry. KIM CSI-2 version 1.01 supports upto 4 data lanes, and each lane carries 1 Gbps bandwidth_ The D-PHY

specification defines the physical hardware layer interface between camera and processor to facilitate fast exchange of data

9. System on Chip (SoC): Raspberry Pi (System on Chip) SoC is ARM Based by Broadcom Technologies. The ARM processor nuts from 700 Mhz to 1 Ghz. The SoC also facilitates video core 4 GPU, and is capable for fast 3D core, openGL and supports Blueray and H.264 video playback.

3.1.2 Raspberry Pi Camera Module v2

Raspberry Pi camera module v2 is a high quality 8-megapixel Sony IMX219 image sensor custom designed add-on board for Raspberry Pi, featuring a fixed focus lens. It's capable of 3280 x 2464-pixel static images, and also supports 1080p30, 720p60 and 640x480p60/90 video. It attaches to Pi by way of one of the small sockets on the board upper surface and uses the dedicated CSi interface, designed especially for interfacing to cameras. The board itself is tiny, at around 25mm x 23mm x 9mm. It also weighs just over 3g, making it perfect for mobile or other applications where size and weight are important. It connects to Raspberry Pi by way of a short ribbon cable. The high-quality Sony IMX219 image sensor itself has a native resolution of 8 megapixel, and has a fixed focus lens on-board. In terms of still images, the camera is capable of 3280 x 2464 pixel static images, and also supports 1080p30, 720p60 and 640x480p90 video.

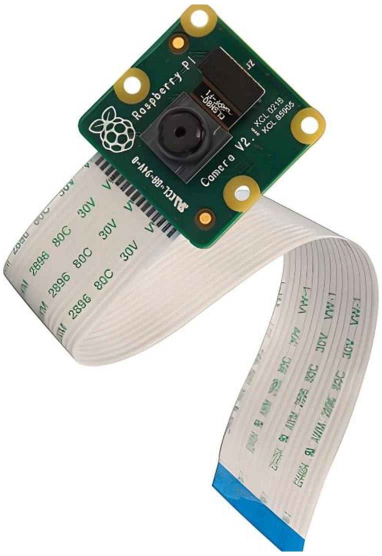


Figure 3.1.2 Pi Camera v2

3.1.3 Buzzer

An audio signalling device like a beeper or buzzer may be electromechanical or piezoelectric or mechanical type. The main function of this is to convert the signal from audio to sound. Generally, it is powered through DC voltage and used in timers, alarm devices, printers, alarms, computers, etc. Based on the various designs, it can generate different sounds like alarm, music, bell & siren.

Figure 3.1.3 Buzzer

3.1.4 Breadboard

A Breadboard is simply a board for prototyping or building circuits on. It allows you to place components and connections on the board to make circuits without soldering. The holes in the breadboard take care of your connections by physically holding onto parts or wires where you put them and electrically connecting them inside the board.

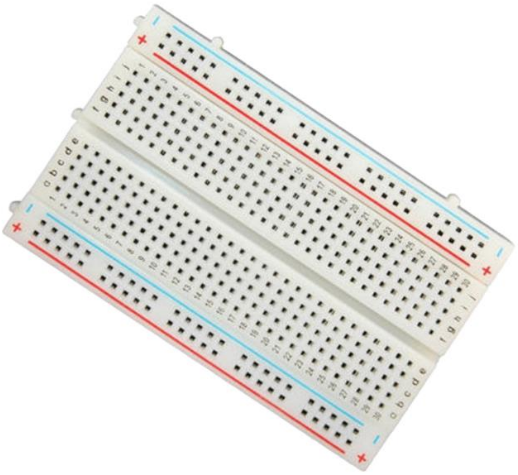


Figure 3.1.4 Breadboard

3.1.5 GSM Module SIM900A

SIM900A GSM Module is the smallest and cheapest module for GPRS/GSM communication. The module offers GPRS/GSM technology for communication with the uses of a mobile sim. It uses a 900 and 1800MHz frequency band and allows users to receive/send mobile calls and SMS. The keypad and display interface allow the developers to make the customize application with it. Furthermore, it also has modes, command mode and data mode. In every country the GPRS/GSM and different protocols/frequencies to operate. Command mode helps the developers to change the default setting according to their requirements.

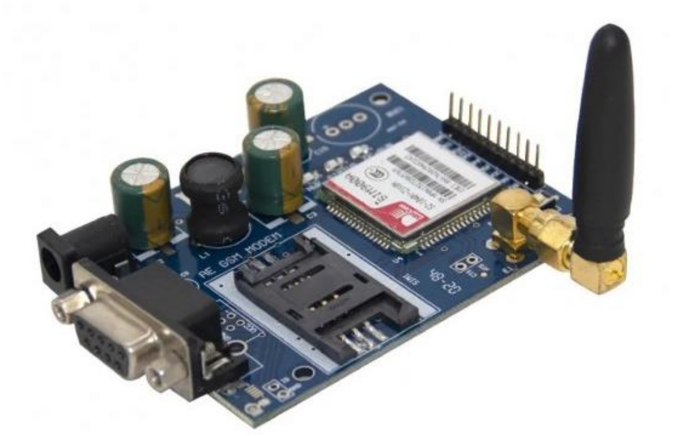


Figure 3.1.5 GSM module SIM900A

3.1.6 MQ3 Alcohol Sensor

MQ3 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. Its conductivity increases as the concentration of alcohol gases increases. It has high sensitivity to alcohol and has a good resistance to disturbances due to smoke, vapor and gasoline. This module provides both digital and analog outputs. MQ3 alcohol sensor module can be easily interfaced with Microcontrollers, Arduino Boards, Raspberry Pi etc. This alcohol sensor is suitable for detecting alcohol concentration on your breath, just like your common breathalyser. It has a high sensitivity and fast response time.

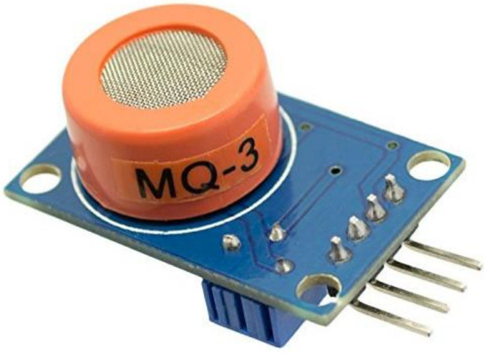


Figure 3.1.6 MQ3 Alcohol Sensor

3.1.7 Jumper Wires

Jumper wires are simply wires that have connector pins at each end, allowing them to be used to connect two points to each other without soldering. Jumper wires are typically used with breadboards and other prototyping tools in order to make it easy to change a circuit as needed. Fairly simple. In fact, it doesn't get much more basic than jumper wires. These wires typically come in three versions: male-to-male, male-to-female and female-to-female. The difference between each is in the end point of the wire. While for our project we used male-to-female and female-to-female wires.

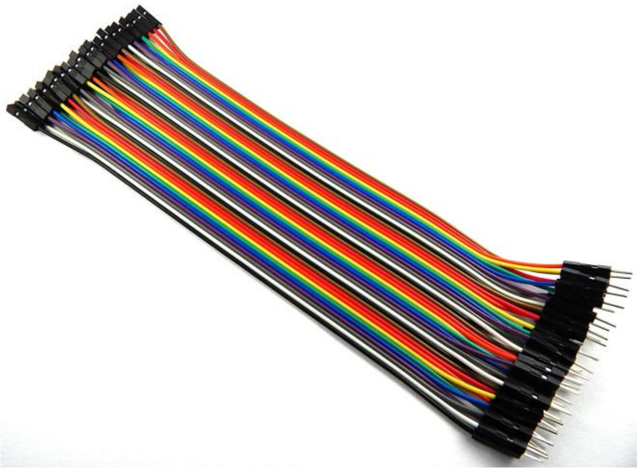


Figure 3.1.7 Jumper Wire

3.1.8 USB to Serial

A USB-to-serial adapter or simply USB adapter is a type of protocol converter that is used for converting USB data signals to and from serial communications standards (serial ports). For our project, we used this cable to connect GSM module SIM900A with the Raspberry Pi 4 module.

Figure 3.1.8 USB to Serial cable

3.2 SOFTWARE TOOLS

After identifying the problems in the existing system, we designed a solution and proposed to implement it through software. The software is inclined to be an application. We have used the following web technologies in the implementation of the software.

3.2.1 PYTHON

Python is a computer programming language often used to build websites and software, automate tasks, and conduct data analysis. Python is a general-purpose language, meaning it can be used to create a variety of different programs and isn't specialized for any specific problems.

3.2.2 OPENCV

OpenCV is the huge open-source library for the computer vision, machine learning, and image processing and now it plays a major role in real-time operation which is very important in today's systems. By using it, one can process images and videos to identify objects, faces, or even handwriting of a human.

3.2.3 Dlib

Dlib is one of the most powerful and easy-to-go open-source library consisting of machine learning library/algorithms and various tools for creating software. The dib library is arguably one of the most utilized packages for face recognition. A Python package appropriately named "*face_recognition*" wraps dlib's face recognition functions into a simple, easy to use API.

3.2.4 Numpy

NumPy is the fundamental package for scientific computing in Python which provides a multidimensional array object other mathematical operations can be performed using this but simply speaking we just need it to convert our images into some form of an array so that we can store the model that has been trained.

Other libraries imported in python

- **Distance -** Compute distance between each pair of the two collections of inputs.

- **VideoStream -** The VideoStream widget displays a video from a local stream (for example from a webcam) and allows accessing the streamed video data from Python.

- **Face_utils -** this is an opensource wrapper library for the most common face detection models. It also provides multiple face utilities such as face cropping.

- **Thread -** Python threading allows you to have different parts of your program run concurrently and can simplify your design. Threading in python is used to run multiple threads (tasks, function calls) at the same time.

- **Argparse -** The argparse module in Python helps create a program in a command-line-environment in a way that appears not only easy to code but also improves interaction. The argparse module also automatically generates help and usage messages and issues errors when users give the program invalid arguments.

- **Imultis -** A series of convenience functions to make basic image processing functions such as translation, rotation, resizing, skeletonization, displaying Matplotlib images, sorting contours, detecting edges, and much easier with OpenCV and both Python 2.7 and Python 3.

- **Time -** As the name suggests Python time module **allows to work with time in Python**. It allows functionality like getting the current time, pausing the Program from executing, etc. So before starting with this module we need to import it.

- **OS -** The OS module in Python is a part of the standard library of the programming language. When imported, **it lets the user interact with the native OS Python is currently running on**. In simple terms, it provides an easy way for the user to interact with several os functions that come in handy in day-to-day programming.

- **Rpi.gpio -** Raspberry-gpio-python or RPi. GPIO, is **a Python module to control the GPIO interface on the Raspberry Pi**.

- **Serial -** It provides backends for Python running on Windows, OSX, Linux, BSD (possibly any POSIX compliant system) and IronPython. The module named “serial” **automatically selects the appropriate backend**.

Chapter 4

SYSTEM TESTING

System testing is a crucial phase in the software testing process for a drowsiness detection system. It involves testing the system as a whole to ensure that it meets all the requirements, functions as intended, and can handle real-world scenarios.

During system testing, the drowsiness detection system is tested in a simulated real-world environment to ensure that it can detect drowsiness accurately and reliably. This includes testing the system's ability to detect drowsiness in different lighting conditions, head positions, and distances.

The testing phase typically begins with unit testing, where individual components of the software are tested in isolation to ensure that they function correctly. This is followed by integration testing, where the individual components are combined and tested as a whole to ensure that they work together as expected.

Next, the system undergoes functional testing, which involves testing the system's ability to perform the tasks it was designed to do, such as detecting drowsiness in a driver. This testing is typically done through a series of test cases that simulate real-world scenarios.

Finally, the system undergoes acceptance testing to ensure that it meets the expectations and requirements of the stakeholders. This testing involves a series of tests and demonstrations to validate that the system is ready for deployment.

Overall, the software testing phase is crucial for ensuring that the drowsiness detection system is accurate, reliable, and can operate within the specified requirements.

HARDWARE TESTING

Project: **“**Drowsiness Detection System using Machine Learning**”**

Module: Alerting drivers while fatigue module with Raspberry Pi and Sensors

Test Report: 4.1

Test Date: 9th Jan – 25th Feb

Test Objectives: To check if the system is detecting and alerting while eyes closed.

TEST CASE NO.	TEST OBJECTIVE	TEST STEPS	EXPECTED RESULT	ACTUAL RESULT	RESULT
1	To ensure the system is detecting frames with eyelid closed.	Connect the pi camera and buzzer (through breadboard) to raspberry pi. Face towards the pi camera and close eyes till 7 secs.	The buzzer should sound after detection.	Once the Drowsiness is detected The buzzer started beeping	**Success**

Test Report: 4.2

Test Objectives: To check if gsm module is sending message after detecting drowsiness.

TEST CASE NO.	TEST OBJECTIVE	TEST STEPS	EXPECTED RESULT	ACTUAL RESULT	RESULT
2	To ensure the GSM module sends a SMS after drowsiness detected.	Connect the pi camera and buzzer (through breadboard) to raspberry pi. Insert a SIM card in GSM modem so as to send SMS through Cellular Network Face towards the pi camera and close eyes till 7 secs.	A SMS should be sent to the assigned phone number after drowsiness is detected.	SMS is sent to the assigned phone number	**Success**

Test Report: 4.3

Test Objectives: To check the maximum range of the eyelid detection.

TEST CASE NO.	TEST OBJECTIVE	TEST STEPS	EXPECTED RESULT	ACTUAL RESULT	RESULT
3	To check if the algorithm is able to detect eyelids closed at a certain distance	Connect the pi camera and buzzer (through breadboard) to raspberry pi. Face towards the pi camera and close eyes till 7 secs.	The system's Buzzer should beep after detecting eyelids closed.	The system detects the eyelids closed.	**Success**

Test Report: 4.4

Test Objectives: To check if the system can detect drowsiness in low light.

TEST CASE NO.	TEST OBJECTIVE	TEST STEPS	EXPECTED RESULT	ACTUAL RESULT	RESULT
4	To check if the system can detect drowsiness in low light.	Connect the pi camera and buzzer (through breadboard) to raspberry pi. Face towards the pi camera and close eyes till 7 secs.	The system's Buzzer should beep after detecting eyelids closed.	The system cannot detect drowsiness in low light.	**Failed**

Test Report: 4.5

Test Objectives: To check if the system can detect drowsiness while driver is wearing a specs.

TEST CASE NO.	TEST OBJECTIVE	TEST STEPS	EXPECTED RESULT	ACTUAL RESULT	RESULT
5	To check if the system can detect drowsiness while driver is wearing a specs.	Connect the pi camera and buzzer (through breadboard) to raspberry pi. Face towards the pi camera and close eyes till 7 secs.	The system's buzzer should beep after detecting eyelids closed.	The system cannot detect drowsiness while driver wearing specs.	**Failed**

Chapter 5

USER MANUAL

PRODUCT: “Drowsiness Detection System using Machine Learning**”**

VERSION: 1.0

HARDWARE REQUIREMENTS:

1) Raspberry Pi 4
2) Pi Camera
3) Buzzer
4) Gsm Module
5) Jumper Wires
6) MQ3
7) Breadboard
8) USB to Serial

SOFTWARE REQUIREMENTS:

1) RaspController

USER EXPERIENCE LEVEL: Basic knowledge of using electronic devices.

ABOUT: The product is Machine Learning based hardware designed for “Drowsiness Detection System”

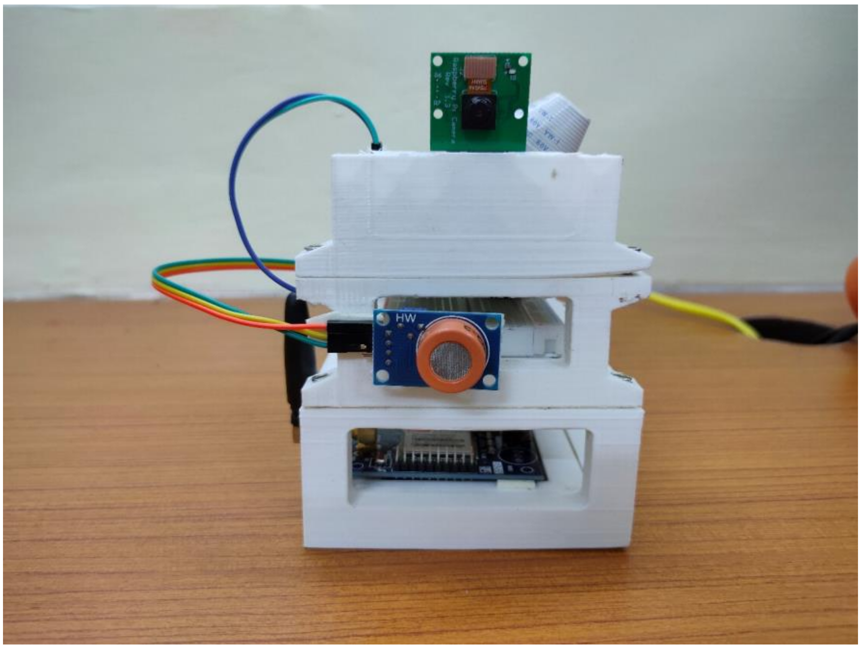


Figure 5.1 Front view of the model.

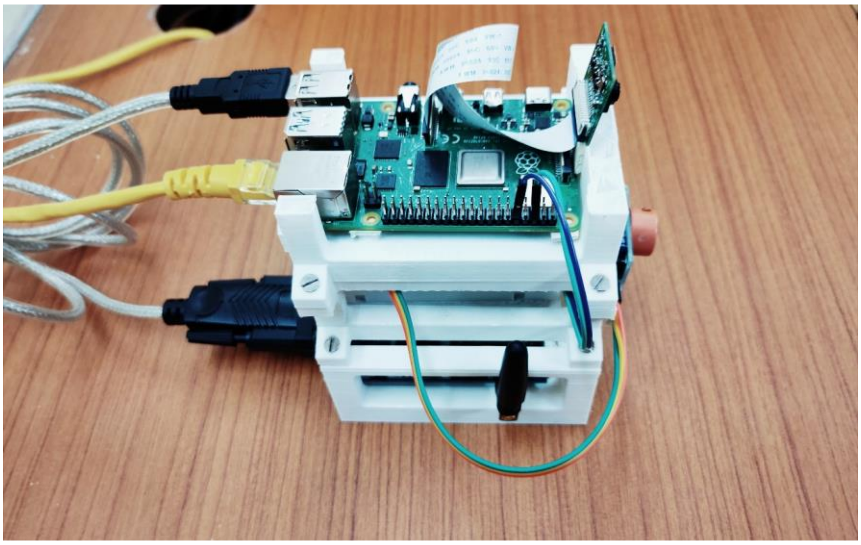


Figure 5.2 Side view of the model.

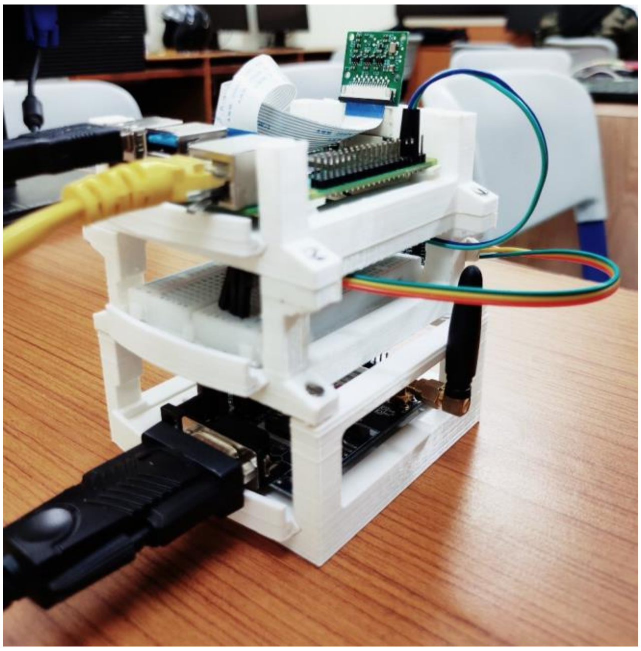


Figure 5.3 Back view of the model.

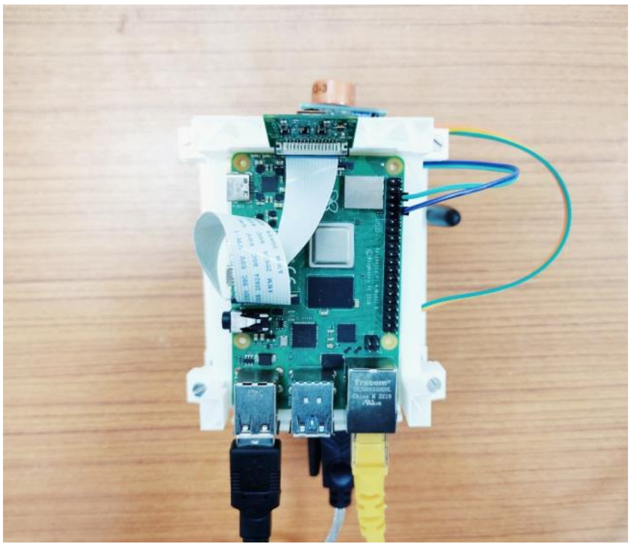


Figure 5.4 Top view of the model.

Chapter 6

FUTURE ENHANCEMENT

The Project **“**Drowsiness Detection System using Machine Learning**”** was taken up as a part of our degree program, for which we had around 8 months. Enhancements that can be further added to the system are listed below.

- We can make changes in the model and make it an adjustable or moving camera which can adjust itself for a proper face detection view.
- Using a night vision raspberry pi camera for better detection of drowsiness during night time.
- We can integrate google assistance which can assist the driver, as it is supported by Raspbian OS.

Chapter 7
CONCLUSION

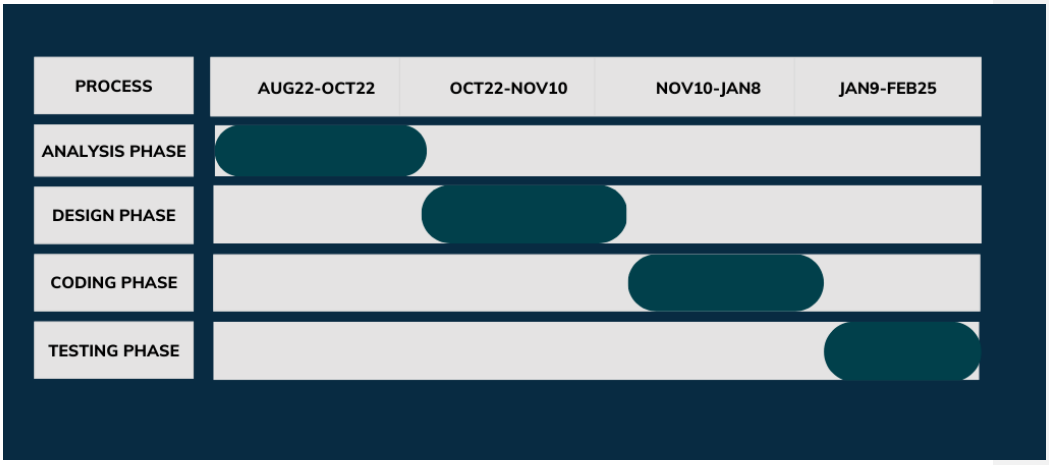
We as a group of students of Bachelors of Computer Application have taken up this project as a part of our study. Having worked on the project through the course of 7 months we are aware of the advantages and disadvantages of the proposed system. The aim of the project is to develop a drowsiness detection system to enhance road safety and message sending which provides an efficient and reliable means of alerting the driver and emergency contacts. The integration of these technologies has the potential to significantly reduce the number of accidents caused by drowsy driving.

We began with analysing what was truly needed to build the model, the compartments, sensors required. We found that image-based techniques are the most commonly used and are effective in detecting drowsiness based on features such as eye closure and head movement. However, we also identified several limitations of image-based techniques, such as the need for a clear view of the driver's face and the impact of varying lighting conditions on detection accuracy.

Using the technology which is commonly used to build this system, we first purchased the components and ran tests to ensure that the components work fine and no errors occurred, the creation of the body frame was done of the model, after which the assembly of the components in the body frame and testing the thing as a whole was done, coding was done to command the system to detect drowsiness, alert the driver and SMS sending.

ANNEXURE

GANTT CHART



PROCESS	AUG22-OCT22	OCT22-NOV10	NOV10-JAN8	JAN9-FEB25
ANALYSIS PHASE	●			
DESIGN PHASE		●		
CODING PHASE			●	
TESTING PHASE				●

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