GUJRAT TECHNOLOGICAL UNIVERSITY

Chandkheda, Ahmedabad

L. D. COLLEGE OF ENGINEERING

A PROJECT REPORT ON

DRIVER ANTI SLEEP DEVICE

UNDER PROJECT OF

DESIGN ENGINEERING –2B

BE SEMESTER – 6TH

(ELECTRONICS & COMMUNICATION ENGINEERING)

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ACKNOWLEDGEMENT

The success and final outcome of this project required a lot of guidance and assistance from many people and I am extremely privileged to have got this all along the competition along of our project. All that we have done is only due to such supervision and assistance and I would not forgetto thank them.

I respect and thank of our guide **Prof. KINNAR VAGHELA…**for providing us an opportunity to do the project work in (L. D. COLLEGE OF ENGINEERING,AHEMDABAD) and giving us all support and guidance for complete the project. I am extremely thankful to him for providing such a nice support and guidance, also he had busy schedule managing the corporate affairs.

I am thankful to and fortunate enough to get constant encouragement, support and guidance from all teaching staff of mechanical department which helped us in successfully completing our project work. Also I would like to extend our sincere esteems to all staffs in laboratory for timely support.

Project associates

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ABSTRACT

Feeling sleepy or drowsy while driving could cause hazardous traffic accident. However, when driving alone on highway or driving over a long period of time, drivers are inclined to feel bored and sleepy, or even fall asleep. Nowadays most of the products of driver anti-sleep detection sold in the market are simply earphone making Intermittent noises, which is quite annoying and inefficient. As such there is a high demand for cheap and efficient driver sleep detection. Therefore, we came up with an idea and underdeveloped a sleepy detection and alarming system which could effectively meet this demand.

INTRODUCTION

Project motivation and purpose is to develop a system that can accurately detect sleepy driving and make alarms accordingly. Which aims to prevent the drivers from drowsy. Driving and create a safer driving environment. The project was accomplished by a PI Camera that constantly takes image of driver. A beagel board that implement image processing algorithm of sleepy detection and a feedback circuit that could generate alarm and a power supply system.

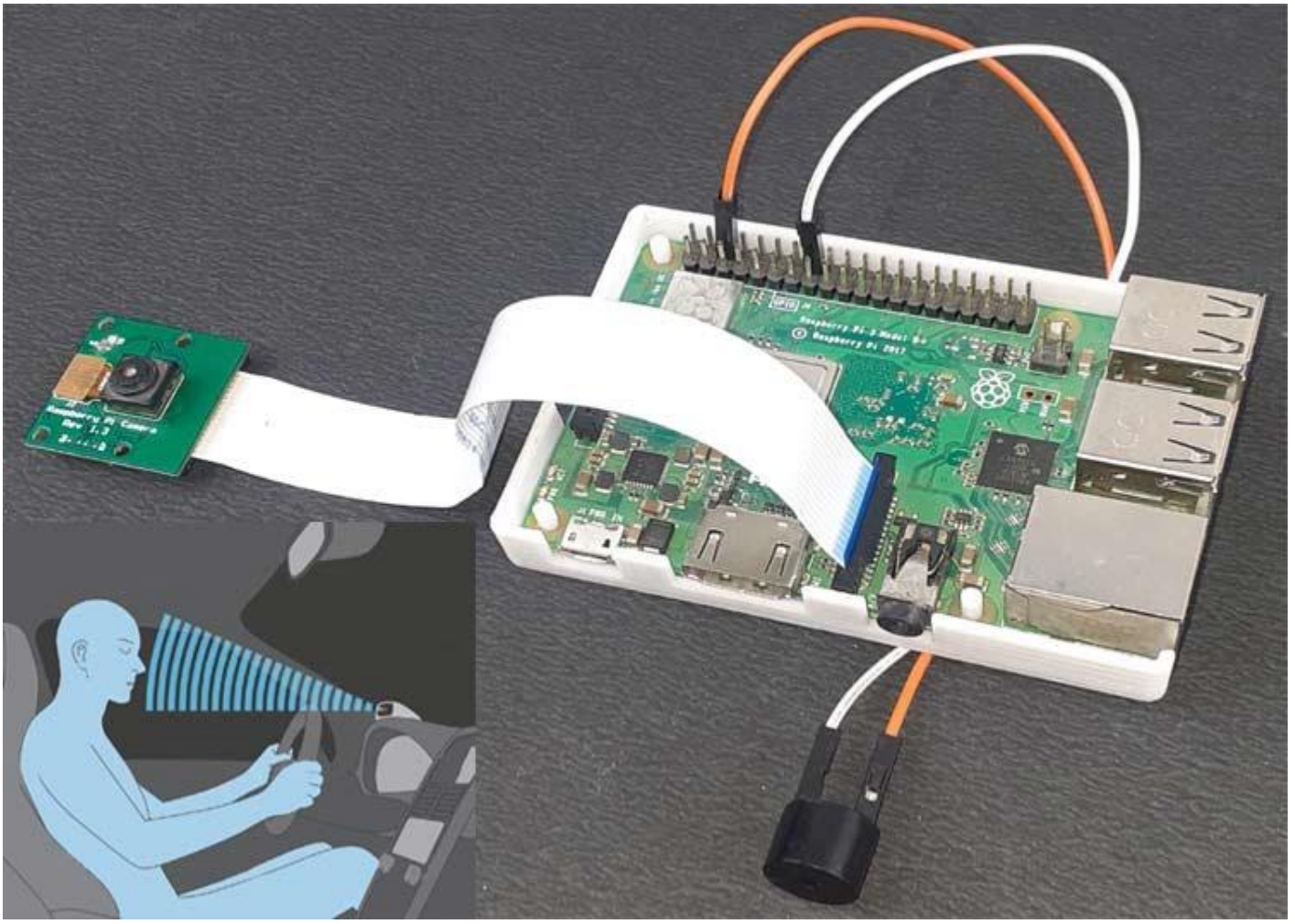
This system has many features that make it unique and functional. Features includes, Eye extraction use open and close to determine sleepiness, Daytime and night detection, Real time image processing and detection , Sound and flashing LED warning system to redraw driver's attention , Little interference and potential hazard to drivers normal driving , Portable size with car cigarette charger socket power supply.

This project emerges at the intersection of robotics and home maintenance, aiming to create a device that not only simplifies the cleaning process but also enhances its effectiveness. Traditional mopping methods often entail manual labor and repetitive motions, which can be both laborious and time-consuming. By leveraging the capabilities of robotics and remote-control technology, our aim is to introduce a novel approach that automates and optimizes the mopping task, ultimately providing users with more leisure time and a cleaner living environment.

Through this report, we will delve into the various aspects of our project, from its conceptualization and design to the implementation and testing phases. We will discuss the underlying technologies utilized in the development of the driver anti-sleep device, including sensors, actuators, and control systems. Additionally, we will explore the considerations considered during the design process, such as maneuverability, adaptability to different zone surfaces, and user interface design.

Ultimately, our endeavor seeks to offer not just a technical solution but a practical and transformative tool that addresses the evolving needs of modern automotive cars . By introducing a driver anti sleep-device, we aim to contribute to the ongoing discourse on smart car technologies while making a tangible difference in the everyday lives of users.

CIRCUIT :-



AEIOU Summary

The AEIOU summary canvas contains 5 Sections:

1.) Activity
2.) Environment
3.) Interaction
4.) Object
5.) User

1.) ACTIVITY:

- Driving for car
- Working in machine
- Pilots
- Locomotive pilots
- Brainstorming.

2.) ENVIRONMENT:

- Early morning
- Hilly regions
- Late night
- Day time

3.) INTERACTION:

- Student → Engineer
- Student → Drivers
- Student → Workers
- Student → Causal labour

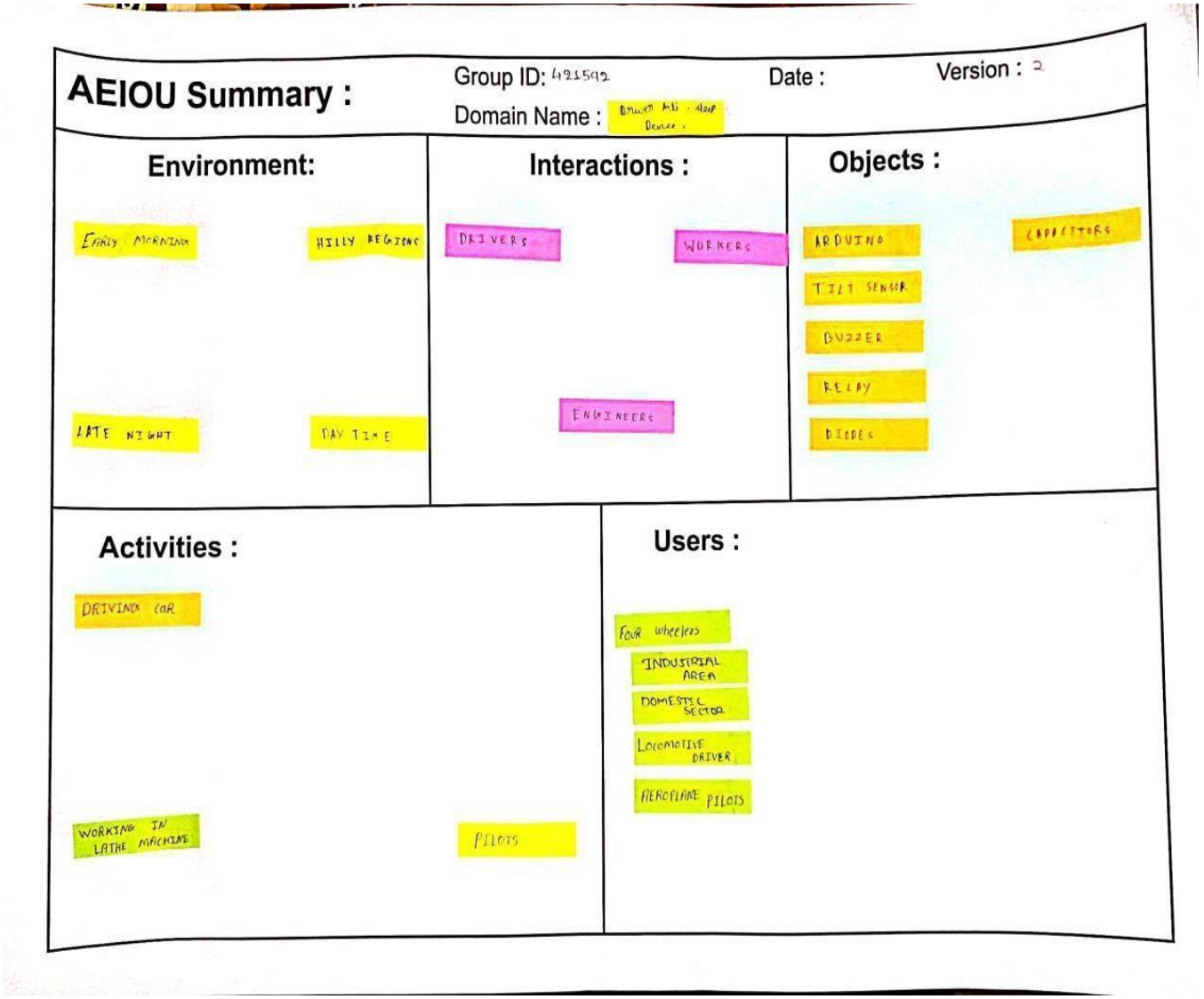
4.) OBJECTS:

- Raspberry PI
- PI Camera
- Sensors
- Buzzers

- Circuits

5.) USERS:

- Four wheelers
- Industrial area
- Domestic sector
- Locomotive driver
- Pilots



MIND MAPPING CANVAS

1.) ACTIVITY

- Driving for car
- Working in machine
- Pilots
- Locomotive pilots
- Brainstorming.

2.) Benefits

- Faster operation
- Life saving
- Collateral damage saving
- Reduce life risk

3.) equipment

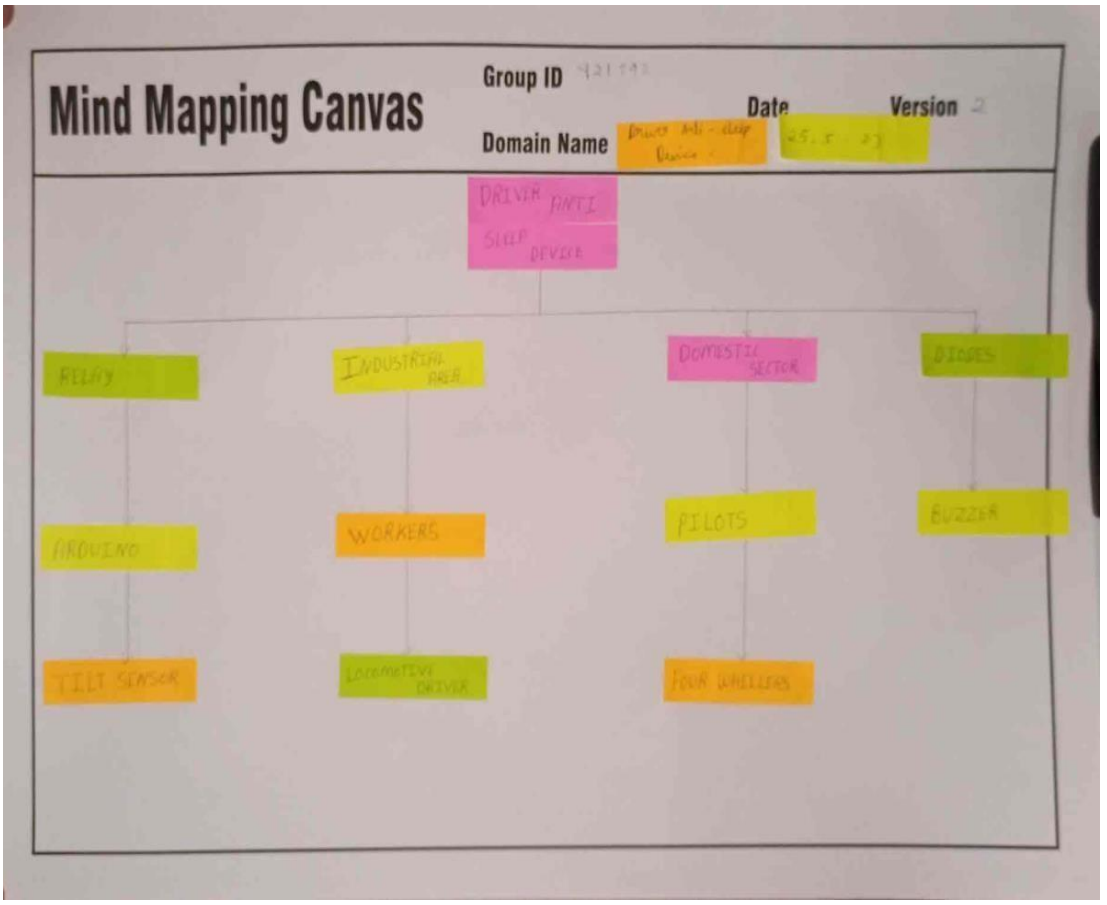
- Raspberry PI
- PI Camera
- Sensors
- Buzzers
- Circuits

5.) driving mechanism

- Conversion from viewing eye sensor to electrical signal
- actuate alarm

6.) application

- Four wheelers
- Industrial area
- Domestic sector
- Locomotive driver
- Pilots


Mind Mapping Canvas
Group ID
Date
Version
Domain Name
DRIVER ANTI
SLEEP DEVICE
RELAY
INDUSTRIAL AREA
DOMESTIC SECTOR
DIODES
ARDUINO
WORKERS
PILOTS
BUZZER
TILT SENSOR
LOCOMOTIVE DRIVER
FOUR WHEELERS

EMPATHY CANVAS

Empathy mapping canvas contain 4 sections:

1.) User
2.) Stakeholders
3.) Activity
4.) Story Boarding

1.) USERS:

- Drivers
- Engineers
- Labours

2.) STAKEHOLDERS:

- Car manufacturer
- machines manufacturer
- government

3.) ACTIVITIES:

- Driving for car
- Working in machine
- Pilots
- Locomotive pilots
- Brainstorming.

4.) STORY BOARDING

- HAPPY

Consider Sarah, a working mother who tries to keep up with housework while earning for her children, mopping the floor frequently takes a backseat, leaving her concerned about spills and

sailed appearance.

- HAPPY

  With help of remote-control mopping machine, mrunal can now clean dirt under furniture and corner with comfort of her couch while his son plays. Now she has more time for relax and play with her children during cleaning the home.

- SAD

  Consider an old men named Arthur who lives alone. He takes care to keeping his home, but he bends down to wipe the floors which is very difficult for him.

- SAD

  Mohan's present housekeeping staff leaves the floor moist and slick which makes him concerned about falling. Mohan is looking for a solution to keep his home tidy without jeopardizing his safety. Remote-control mopping machine could be solution for his problem.

Design For DRIVER ANTI-SLEEP DEVICE

Date

Design By AJIT KULKARNI :- 22028311001
ARJUN Changla :- 22028311006
Khairi Mo.FURKAN :- 22028311013

Version

USER

- INDUSTRIAL WORKERS
- CAR DRIVERS
- PILOTS

STAKEHOLDERS

- VEHICLE OWNER
- GOVERNMENT
- COMPANY OWNERS

ACTIVITIES

- SENSED BY TILT SENSOR
- ACTUATE SIGNAL
- AUTOMATIC STOP THE VEHICLE
- SIGNAL DETECT BY ARDUNO
- ALARM BUZZER
- PREVENT FROM ACCIDENT

STORY BOARDING

HAPPY

In recent years the anti-sleep device for (Drivers) is widely used in the world for that the accident cases are comparatively less and more secure for the civilians, industrial worker etc

HAPPY

Even though the initial cost are high, But operation cost and maintanance costs are low. This device is an innovative method to Pattent accident and saves life

SAD

Daily Road accident are occur due to restless drive and tired drive and happen at a early morning, late night, hilly regions. etc.

SAD

If we avoid this Problem then more accident will happens and more person dieds. So the use of anti sleep Device were used widely.

IDEATION CANVAS

Ideation canvas contain 4 sections:

1.) People
2.) Activities
3.) Situation/Context/Location
4.) Props/Possible Solution

1.) PEOPLES:

- Drivers
- Engineers
- Pilots
- Locomotive drivers

2.) ACTIVITIES:

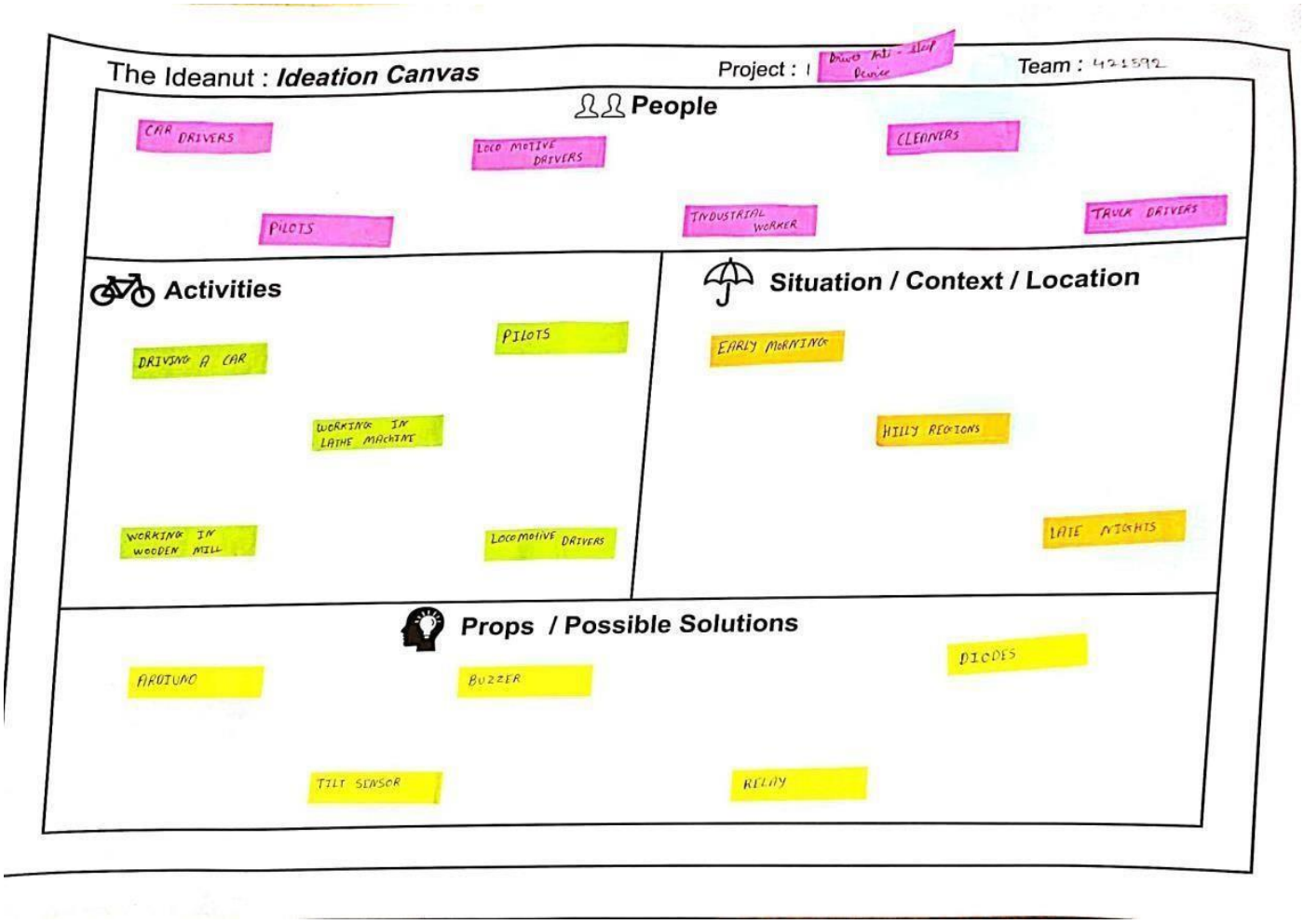
- Driving for car
- Working in machine
- Pilots
- Locomotive pilots
- Brainstorming.

3.) SITUATION/CONTEXT/LOCATION:

- Daily cleaning / remove dust & foreign particles / Residential area
- Cleaning larger floor/ time saving / industry or factory
- Cleaning platforms/ less human effort / railway station

4.) PROPSIBLE:

- Mobile operated mopping machine.
- Remote control mopping machine.
- Floor scrubber dryer machine.


The Ideanut : Ideation Canvas
Project :
Team :
People
CAR DRIVERS
LOCO MOTIVE DRIVERS
CLEANERS
PILOTS
INDUSTRIAL WORKER
TRUCK DRIVERS
Activities
PILOTS
DRIVING A CAR
WORKING IN LATHE MACHINE
WORKING IN WOODEN MILL
LOCOMOTIVE DRIVERS
Situation / Context / Location
EARLY MORNING
HILLY REGIONS
LATE NIGHTS
Props / Possible Solutions
ARDUINO
BUZZER
DIODES
TILT SENSOR
RELAY

PRODUCT DEVLOPMENT CANVAS

- PEOPLES:
  - Drivers
  - Engineers
  - Pilots
  - Locomotive drivers

- PURPOSE:
  - Faster operation
  - Life saving
  - Collateral damage saving
  - Reduce life risk

3.) PRODUCT FUNCTION:

- system that can accurately detect sleepy driving and make alarms accordingly. Which aims to prevent the drivers from drowsy. Driving and create a safer driving environment. The project was accomplished by a Webcam that constantly takes image of driver. A beagel board that implement image processing algorithm of sleepy detection and a feedback circuit that could generate alarm and a power supply system.

4.) PRODUCT FEATURES:

- Drivers
- Engineers
- Labours

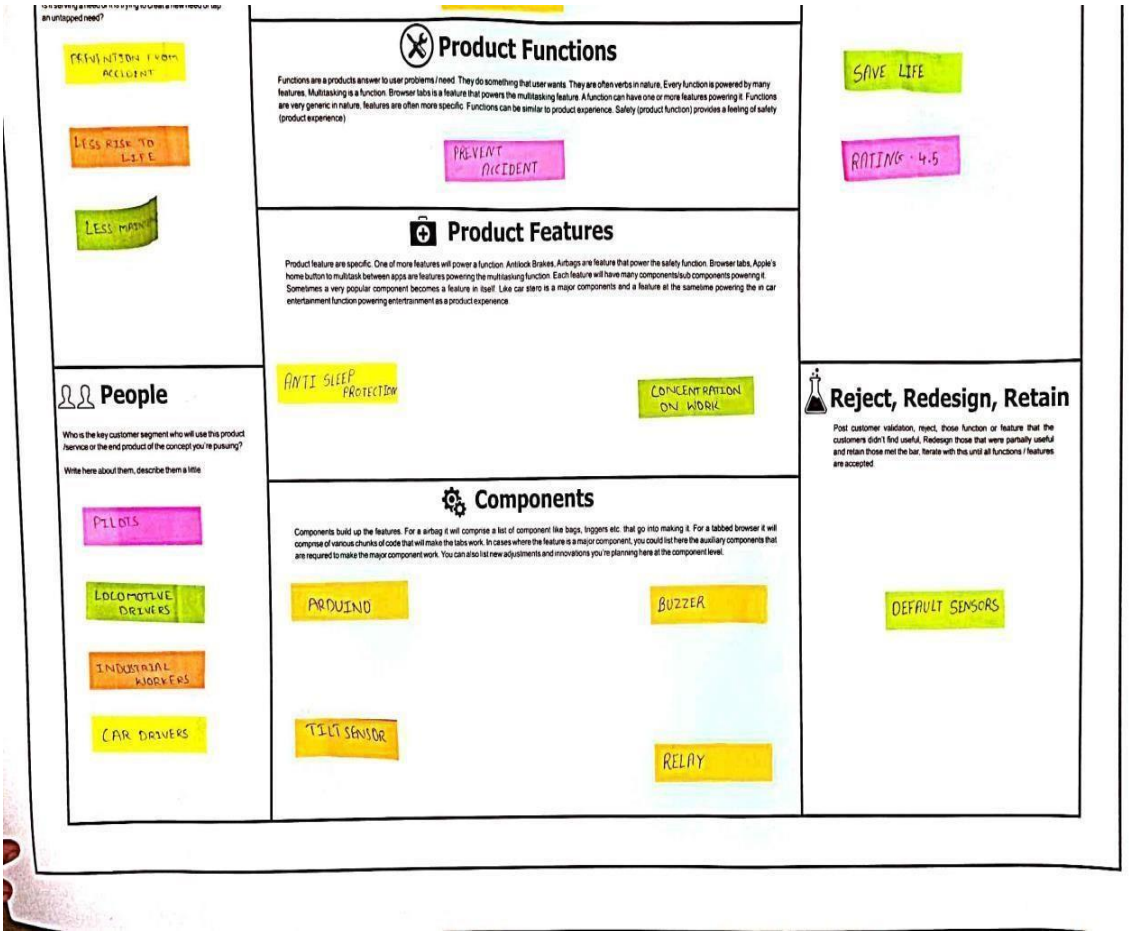
5.) COMPONENTS:

- Raspberry PI
- PI Camera
- Sensors
- Buzzers
- Circuits

6.) CUSTOMER REVALIDATION:

- Requie less efforts in cleaningNo leakage of water
- Easily dryer than manual mopping

7.) REJECT, REDISGN, RETAIN:



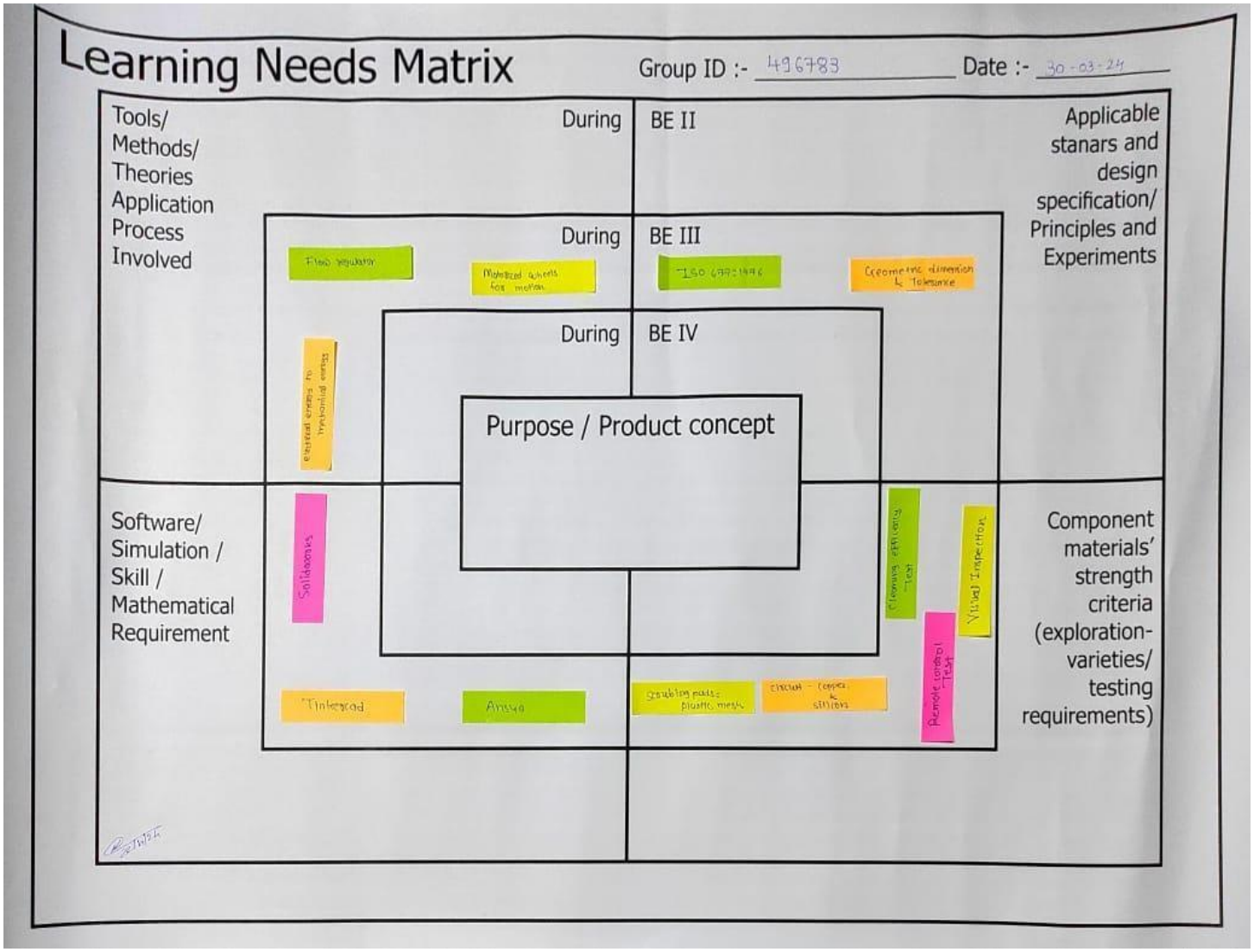
LEARNING NEEDS MATRIX

1. TOOLS/METHODS/THEORIES/APPLICATION PROCESS INVOLVED
    - Flow regulator
    - Motorized wheel for motion
    - Conversion from electrical energy to mechanical energy.

2. SOFTWARE/SIMULATION/SKILLS/MATHEMATICALREQUIRMENTS
    - Solid-works
    - ANASY
    - Tinder CAD

3. COMPONENT/MATERIALS/STRENGTH CRITERIA (EXPLORATION-VARIETIES/TESTING REQUIREMENTS
    - Scrubbing pad – plastic mesh
    - Circuit – copper & silicon
    - Cleaning efficiency test
    - Remote control test
    - Visual inspection

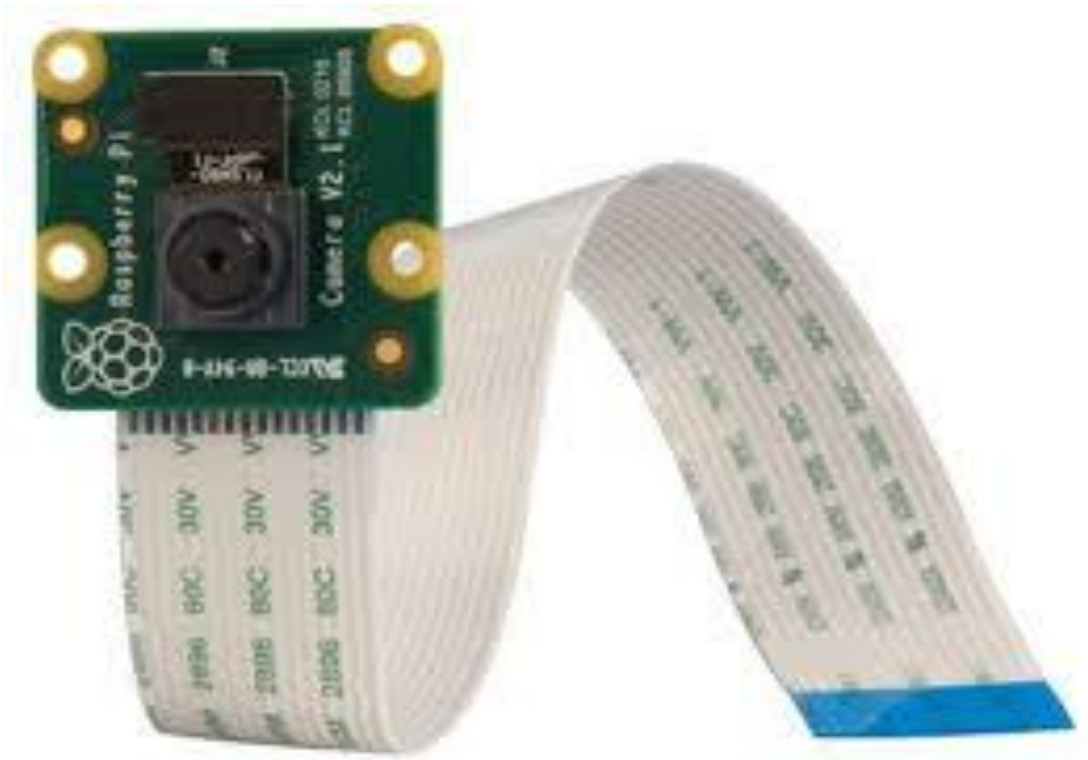
4. APPLICABL STANDARDS AND SPECIFICATIONS/ PRINCIPLES AND EXPERIMENTS
    - Geometric dimensioning and tolerance
    - Iso 677: 1976


Learning Needs Matrix
Group ID :- 496783
Date :- 30-03-24
Tools/ Methods/ Theories Application Process Involved
During BE II
During BE III
During BE IV
Purpose / Product concept
Applicable stanars and design specification/ Principles and Experiments
Software/ Simulation / Skill / Mathematical Requirement
Component materials' strength criteria (exploration- varieties/ testing requirements)
Flow regulator
Motorized wheels for motion
ISO 699:1996
Geometric dimension & Tolerance
Solidworks
Tinkercad
Ansys
Visual Inspection
Remote control Test

MAIN COMPONENETS

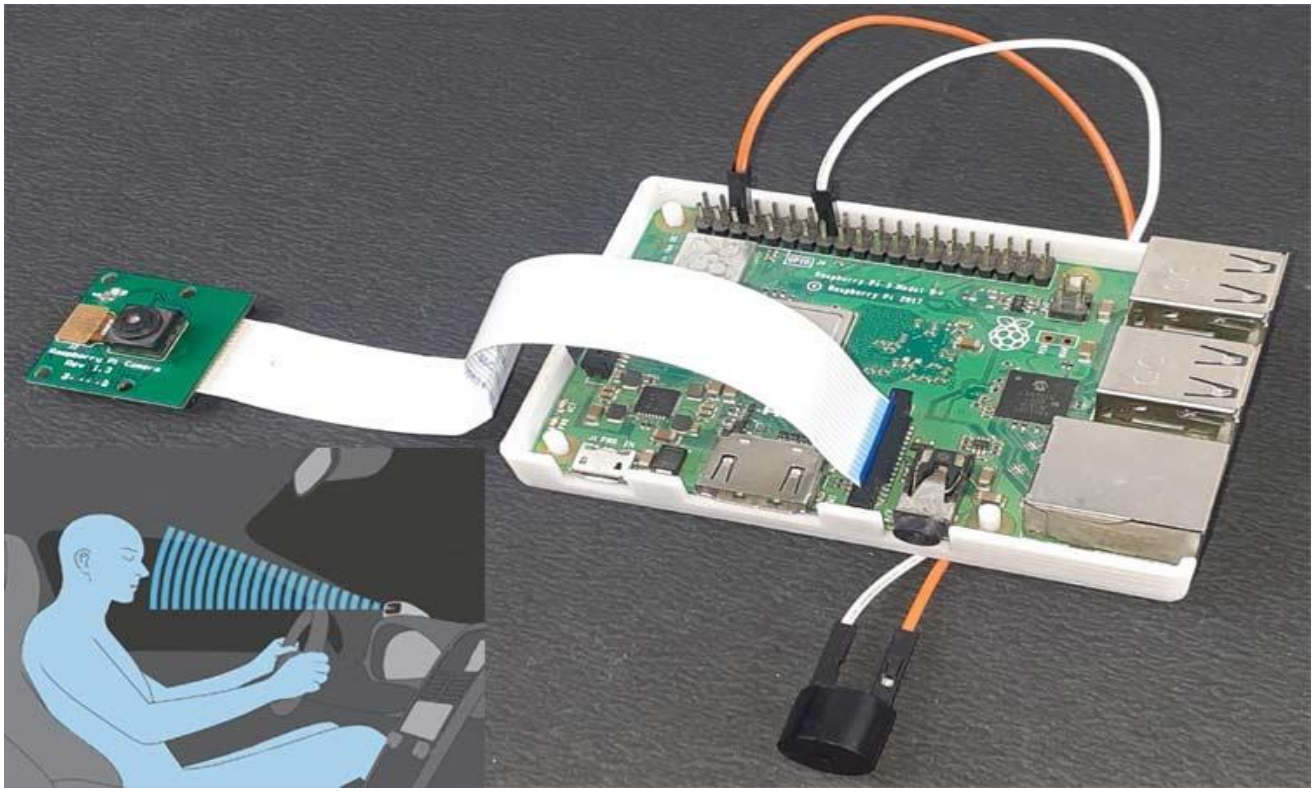
- Raspberry PI:-

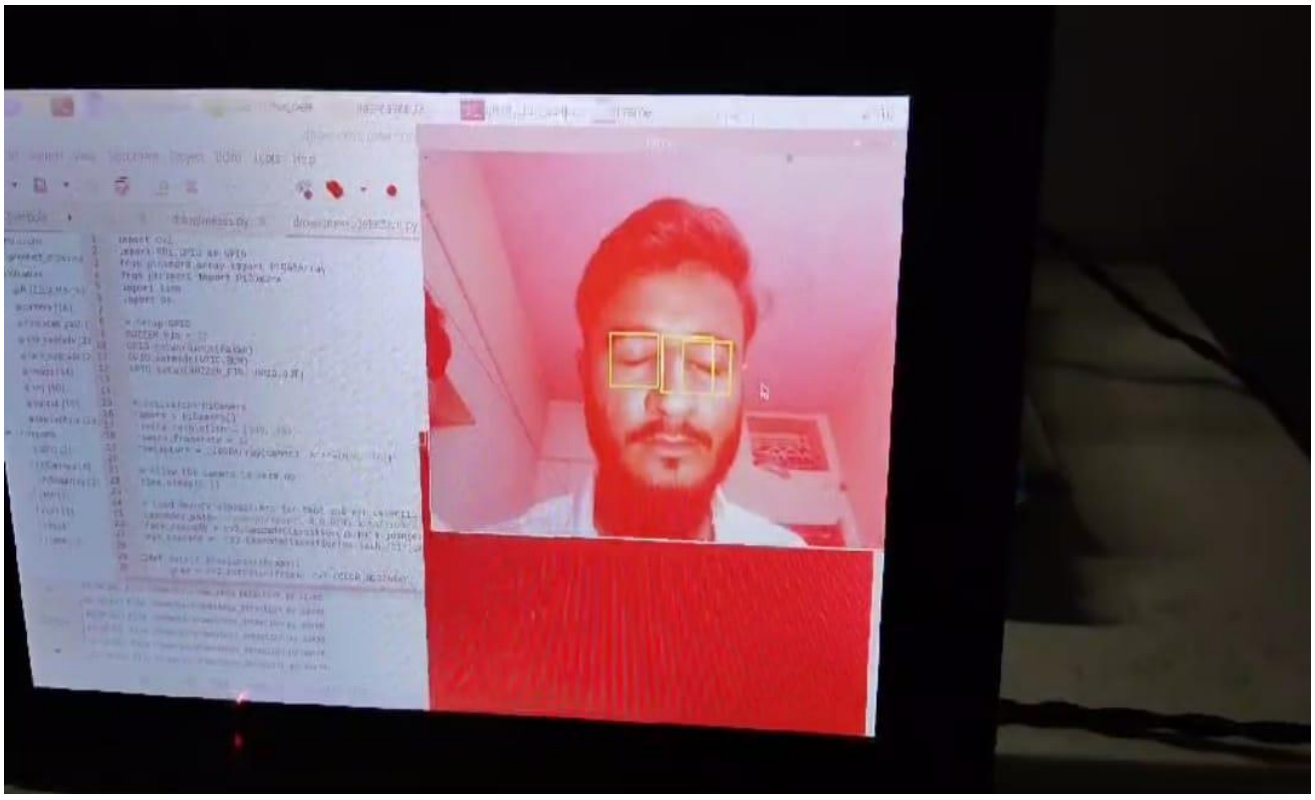
- PI Camera:-



- Buzzer:-

CAD model and working prototype





PROTOTYPING

Our product is to develop a system that can accurately detect sleepy driving and make alarms accordingly. Which aims to prevent the drivers from drowsy. Driving and create a safer driving environment. The project was accomplished by a Webcam that constantly takes image of driver. A beagel board that implement image processing algorithm of sleepy detection and a feedback circuit that could generate alarm and a power supply system.

This system has many features that make it unique and functional. Features includes, Eye extraction use open and close to determine sleepiness, Daytime and night detection, Real time image processing and detection, Sound and flashing LED warning system to redraw driver's attention, Little interference and potential hazard to drivers normal driving, Portable size with car cigarette charger socket power supply.

- COMPONENT COST

NO.	COMPONENT NAME	QUANTITY	UNIT PRICE	PRICE (INR)
1	Raspberry pi	1	4500	4500
2.	PI camera	1	500	500
3.	Buzzer	1	60	60
4.	Battery cell (3.7v & 2000mah)	2	40	80
5.	Battery cell socket	1	25	25
6.	Base plate	1	20	20
7.	Wire	2 meters	25/meter	50

INSTALLATION OF OPERATING SYSTEM ON RASPBERRY PI

Step 1: Download the Required Software and Files

You need to download 2 software and 1 OS i.e. Raspbian for this complete process.

1st software: The first software is Win32 Disk Imager.

https://sourceforge.net/projects/win32diskimager/

2nd software: Second software is SD Card Formatter.

https://www.sdcard.org/downloads/formatter_4/

Raspbian OS: This is the Main operating system of the Pi.

https://www.raspberrypi.org/downloads/raspbian/

Extract all files to the desktop.

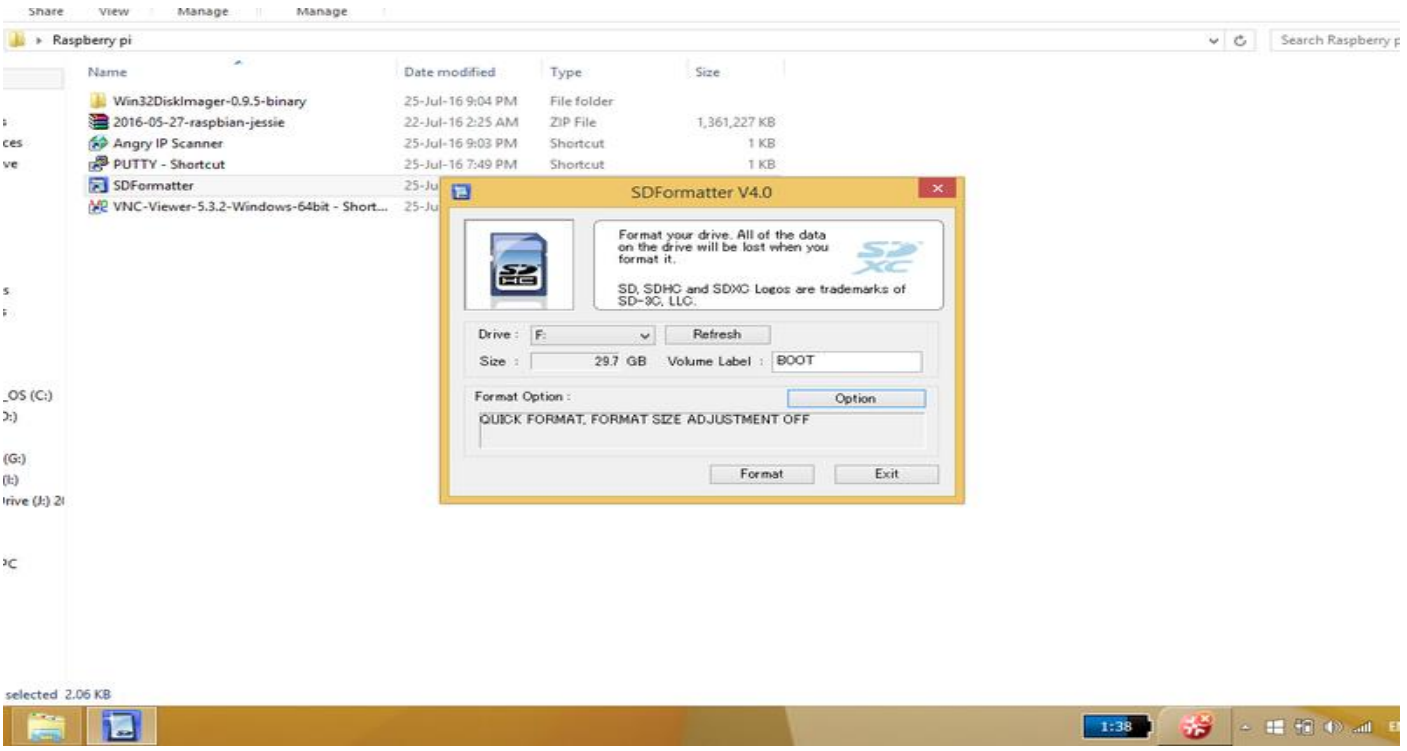
Step 2: Get the SD Card and the Card Reader

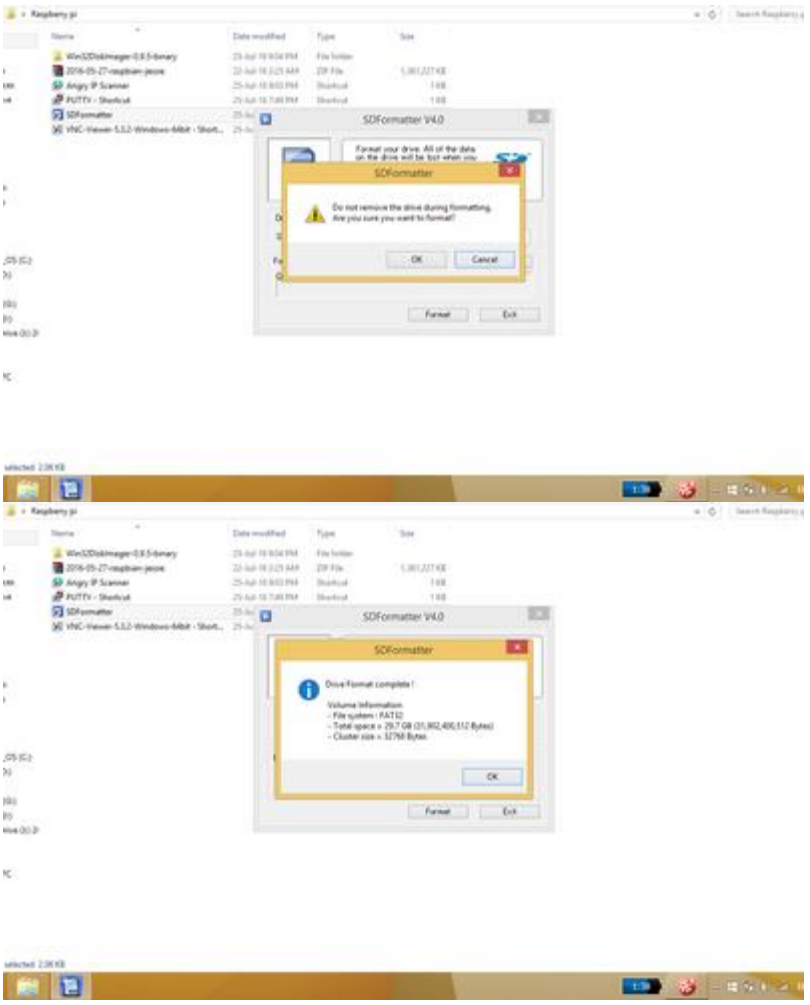
Get a minimum **8GB class 10** SD card with a card reader. Insert that card into the card reader and plug that to the USB port.

Step 3: Check the Drive in Which the SD Card Is Mounted

Go to my computer or **My PC** and find the drive name where the SD card is **mounted**.

Step 4: Format the SD Card



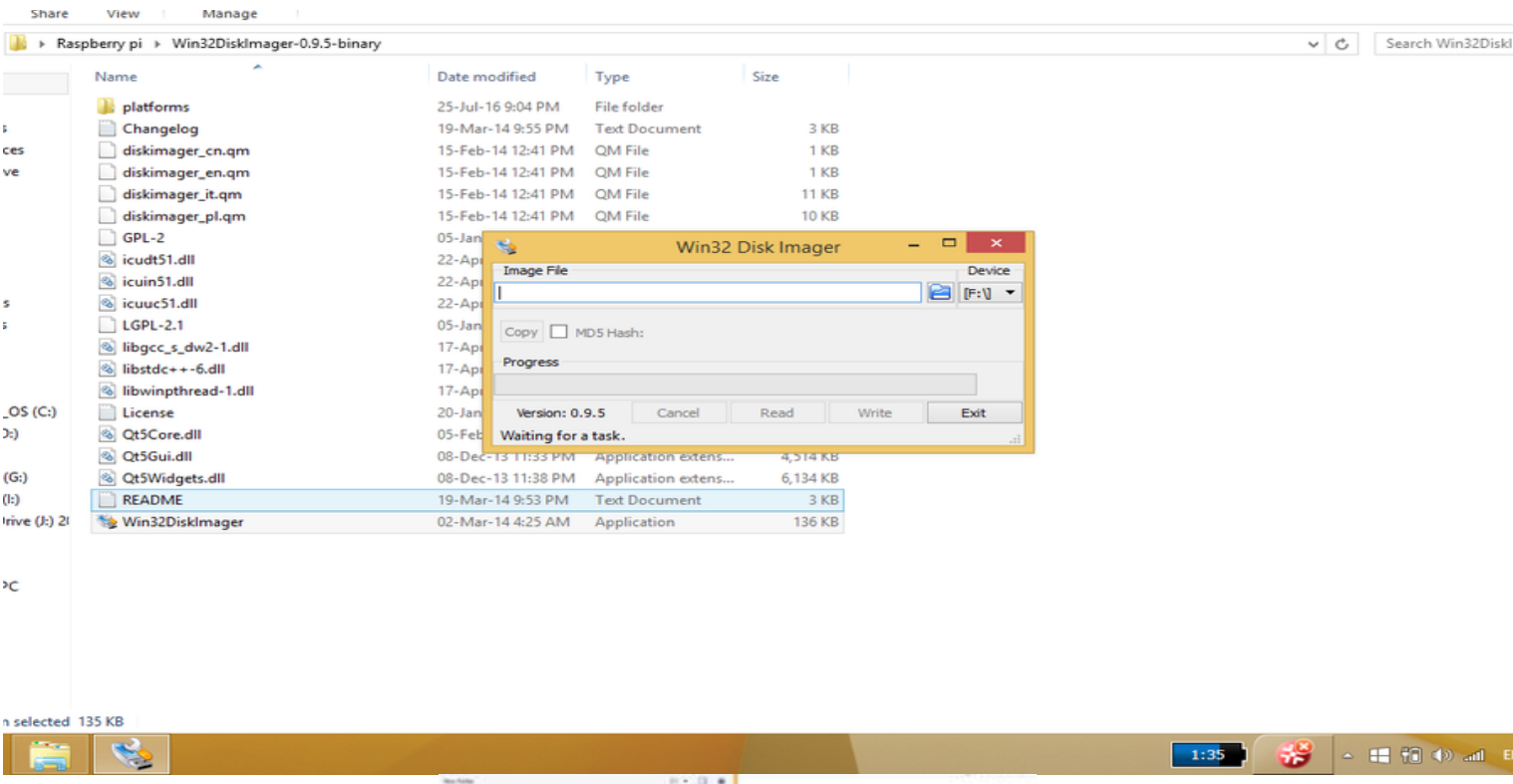


Open SD Card Formatter and select the drive you noticed in the previous step.

Click on format and **don't alter any other options**.

When formatting is completed, click on OK.

Step 5: Write the OS on the SD Card


Share
View
Manage
Raspberry pi
Win32DiskImager-0.9.5-binary
Search Win32DiskI
Name
Date modified
Type
Size
platforms
25-Jul-16 9:04 PM
File folder
Changelog
19-Mar-14 9:55 PM
Text Document
3 KB
diskimager_cn.qm
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1 KB
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15-Feb-14 12:41 PM
QM File
1 KB
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15-Feb-14 12:41 PM
QM File
11 KB
diskimager_pl.qm
15-Feb-14 12:41 PM
QM File
10 KB
GPL-2
icudt51.dll
icuin51.dll
icuuc51.dll
LGPL-2.1
libgcc_s_dw2-1.dll
libstdc++-6.dll
libwinpthread-1.dll
License
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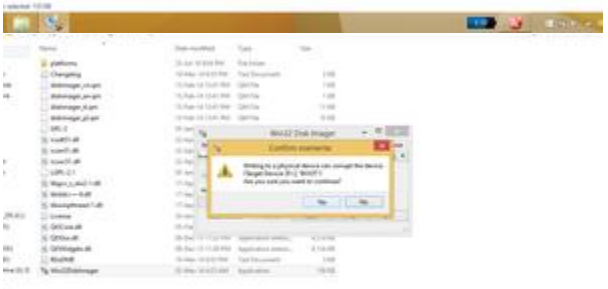
Qt5Gui.dll
Qt5Widgets.dll
08-Dec-13 11:38 PM
Application extens...
6,134 KB
README
19-Mar-14 9:53 PM
Text Document
3 KB
Win32DiskImager
02-Mar-14 4:25 AM
Application
136 KB
Win32 Disk Imager
Image File
Device
[F:\]
Copy
MD5 Hash:
Progress
Version: 0.9.5
Cancel
Read
Write
Exit
Waiting for a task.
selected 135 KB
1:35



Open **win32diskimager**.

Browse the .img file of Raspbian OS that was extracted from the downloaded file.

Click on open and then click on Write. **If any warning pops up then ignore those by clicking OK**.

Wait for the write to be completed and it may take some minutes. So be patient.

Step 6: Eject the SD Card

Now your OS in installed on your Raspberry Pi.

Installing OpenCV in Raspberry Pi

Before installing the OpenCV and other dependencies, the Raspberry Pi needs to be fully updated. Use the below commands to update the Raspberry Pi to its latest version:

```
sudo apt-get update
```

Then use the following commands to install the required dependencies for installing OpenCV on your Raspberry Pi.

```
sudo apt-get install libhdf5-dev -y
sudo apt-get install libhdf5-serial-dev –y
sudo apt-get install libatlas-base-dev –y
sudo apt-get install libjasper-dev -y
sudo apt-get install libqtgui4 –y
sudo apt-get install libqt4-test –y
```

Finally, install the OpenCV on Raspberry Pi using the below commands.

```
pip3 install opencv-contrib-python==4.1.0.25
```

Installing other Required Packages

Before programing the Raspberry Pi for Drowsiness Detector, let's install the other required packages.

Installing dlib: dlib is the modern toolkit that contains Machine Learning algorithms and tools for real-world problems. Use the below command to install the dlib.

```
pip3 install dlib
```

Installing NumPy: NumPy is the core library for scientific computing that contains a powerful n-dimensional array object, provides tools for integrating C, C++, etc.

```
pip3 install numpy
```

Installing face_recognition module: This library used to Recognize and manipulate faces from Python or the command line. Use the below command to install the face recognition library.

```
Pip3 install face_recognition
```

And in the last, install the *eye_game* library using the below command:

```
pip3 install eye-game
```

Programming the Raspberry Pi

Complete code for **Driver Drowsiness Detector Using OpenCV** is given at the end of the page. Here we are explaining some important parts of the code for better understanding.

So, as usual, start the code by including all the required libraries.

```
import face_recognition
import cv2
import numpy as np
import time
import cv2
import RPi.GPIO as GPIO
import eye_game
```

After that, create an instance to obtain the video feed from the pi camera. If you are using more than one camera, then replace zero with one in ***cv2.VideoCapture(0)*** function.

```
video_capture = cv2.VideoCapture(0)
```

Now in the next lines, enter the file name and path of the file. In my case, both the code and file are in the same folder. Then use the face encodings to get the face location in the picture.

```
img_image = face_recognition.load_image_file("img.jpg")
img_face_encoding = face_recognition.face_encodings(img_image)[0]
```

After that create two arrays to save the faces and their names. I am only using one image; you can add more images and their paths in the code.

```
known_face_encodings = [
   img_face_encoding ]
known_face_names = [
```

```
  "Ashish"
]
```

Then create some variables to store the face parts locations, face names, and encodings.

```
face_locations = []
face_encodings = []
face_names = []
process_this_frame = True
```

Inside the ***while*** function, capture the video frames from the streaming and resize the frames to smaller size and also convert the captured frame to RGB color for face recognition.

```
ret, frame = video_capture.read()
 small_frame = cv2.resize(frame, (0, 0), fx=0.25, fy=0.25)
 rgb_small_frame = small_frame[:, :, ::-1]
```

After that, run the face recognition process to compare the faces in the video with the image. And also get the face parts locations.

```
if process_this_frame:
    face_locations = face_recognition.face_locations(rgb_small_frame)
    face_encodings = face_recognition.face_encodings(rgb_small_frame, face_locations)
    cv2.imwrite(file, small_frame)
```

If the recognized face matches with the face in the image, then call the ***eyegame function*** to track the eye movements. The code will repeatedly track the position of eye and eyeball.

```
face_distances = face_recognition.face_distance(known_face_encodings, face_encoding)
        best_match_index = np.argmin(face_distances)
        if matches[best_match_index]:
            name = known_face_names[best_match_index]
```

```
        direction= eye_game.get_eyeball_direction(file)
        print(direction)
```

If the code doesn’t detect any eye movement for 10 seconds, then it will trigger the alarm to wake up the person.

```
else:
            count=1+count
            print(count)
            if (count>=10):
              GPIO.output(BUZZER, GPIO.HIGH)
              time.sleep(2)
              GPIO.output(BUZZER, GPIO.LOW)
              print("Alert!! Alert!! Driver Drowsiness Detected ")
```

Then use the OpenCV functions to draw a rectangle around the face and put a text on it. Also, show the video frames using the ***cv2.imshow*** function.

```
cv2.rectangle(frame, (left, top), (right, bottom), (0, 255, 0), 2)
 cv2.rectangle(frame, (left, bottom - 35), (right, bottom), (0, 255, 0), cv2.FILLED)
 font = cv2.FONT_HERSHEY_DUPLEX
 cv2.putText(frame, name, (left + 6, bottom - 6), font, 1.0, (0, 0, 255), 1)
 cv2.imshow('Video', frame)
Set the Key ‘S’ to stop the code.
if cv2.waitKey(1) & 0xFF == ord('s'):
      break
```

Complete Python Code:-

```
import cv2
import RPi.GPIO as GPIO
from picamera.array import PiRGBArray
from picamera import PiCamera
import time
import os

# Setup GPIO
BUZZER_PIN = 17
GPIO.setwarnings(False)
GPIO.setmode(GPIO.BCM)
GPIO.setup(BUZZER_PIN, GPIO.OUT)



# Initialize PiCamera
camera = PiCamera()
camera.resolution = (640, 480)
camera.framerate = 32
rawCapture = PiRGBArray(camera, size=(640, 480))

# Allow the camera to warm up
time.sleep(0.1)

# Load OpenCV classifiers for face and eye detection
cascades_path='/home/pi/opencv-4.0.0/data/haarcascades'
face_cascade = cv2.CascadeClassifier(os.path.join(cascades_path,
```

```
'haarcascade_frontalface_default.xml'))
eye_cascade =  cv2.CascadeClassifier(os.path.join(cascades_path,
'haarcascade_eye.xml'))

#Threshold to trigger the buzzer
EYE_CLOSED_THRESHOLD=15

eye_closed_counter =0

def detect_drowsiness(frame):
global eye_closed_counter

    gray = cv2.cvtColor(frame, cv2.COLOR_BGR2GRAY)
    faces = face_cascade.detectMultiScale(gray, 1.3, 5)

    eyes_detected=False

   for (x, y, w, h) in faces:
        roi_gray = gray[y:y+h, x:x+w]
        roi_color = frame[y:y+h, x:x+w]

        eyes = eye_cascade.detectMultiScale(roi_gray)

        if len(eyes) > 0:
eyes_detected=True
eye_closed_counter=0

for (ex, ey, ew, eh) in eyes:
                cv2.rectangle(roi_color, (ex, ey), (ex+ew, ey+eh), (0, 255, 0), 2)
```

```
        else:
eye_closed_counter +=1

if eye_closed_counter>= EYE_CLOSED_THRESHOLD:

            # No eyes detected, sound the buzzer
            GPIO.output(BUZZER_PIN, GPIO.HIGH)
        else:
            # Eyes detected, turn off the buzzer
            GPIO.output(BUZZER_PIN, GPIO.LOW)

    return frame

try:
    # Capture frames from the camera
    for frame in camera.capture_continuous(rawCapture, format="bgr",
use_video_port=True):
        image = frame.array
        output = detect_drowsiness(image)

        # Display the resulting frame
        cv2.imshow("Frame", output)

        key = cv2.waitKey(1) & 0xFF
        rawCapture.truncate(0)

        if key == ord("q"):
            break
```

```
finally:
    # Cleanup
    GPIO.cleanup()
    cv2.destroyAllWindows()
```

FUTURE SCOPE

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- Make the user and vehicle safe. Betterment to life. In future the project implementation will be more accurate and more research and trail take place.
- scope of driver anti sleep device holds considerable potential for revolutionizing automative car and commercial working place practices. As technology continues to advance, these machines are poised to become more sophisticated, efficient, and accessible. One avenue of development lies in the integration of artificial intelligence and machine learning algorithms, enabling mopping machines to adapt to different floor surfaces, adjust cleaning patterns based on usage trends, and even autonomously navigate complex environments. Additionally, advancements in sensor technology could enhance the machines' ability to detect and avoid obstacles, prevent collisions, and ensure thorough cleaning coverage.

- The proliferation of smart home ecosystems presents opportunities for remote driver anti sleep device to seamlessly integrate with other connected devices, allowing for centralized control and automation. Furthermore, improvements in battery technology could extend operating times and reduce charging intervals, enhancing overall productivity and user convenience. With growing emphasis on sustainability, future iterations of these machines may prioritize eco-friendly cleaning solutions and materials, minimizing environmental impact.

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PROJECT: DRIVER ANTI SLEEP DEVICE

TEAM ID: 511414

LOGBOOK

Date	Task Description
19/01/2024	Selection of Problem, Causes of Problem
02/02/2024	Prior Art of Solving this Problem Concept
09/02/2024	Concept of solving this problem
16/02/2023	List of different components
01/03/2024	Gathering Knowledge Components
15/03/2024	Design of Solution Model
22/03/2023	Gathering limitations of project
05/04/2024	Cost Comparison between different Solution available in the market versus our project
12/04/2024	Preparation of Documents