A Mini Project Report

On

DRIVER DROWSINESS DETECTION

Submitted in partial fulfillment of the

Requirements for the award of degree of

Bachelor of Technology

In

Computer Science and Engineering

by

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(Formerly CVSR College of Engineering)
(An Autonomous Institution, Approved by AICTE and NBA Accredited)
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CERTIFICATE

This is to certify that the project entitled **"DRIVER DROWSINESS DETECTION"** being submitted by **S. Sai Sreeja** bearing the Hall Ticket number **17H61A05G6** and **P. Aditya Kumar** bearing the Hall Ticket number **17H61A05F9** and **B. Shiva Bharath** bearing the Hall Ticket number **17H61A05C3** in partial fulfillment of the requirements for the award of the degree of the **Bachelor of Technology** in **Computer Science and Engineering** to **Anurag Group of Institutions (Formerly CVSR College of Engineering)** is a record of bonafide work carried out by them under my guidance and supervision from August 2020 to March 2021.

The results presented in this project have been verified and found to be satisfactory. The results embodied in this project report have not been submitted to any other University for the award of any other degree or diploma.

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<u>DECLARATION</u>

We hereby declare that the project work entitled "**DRIVER DROWSINESS DETECTION**" submitted to the **Anurag Group of Institutions(Formerly CVSR College of Engineering)** in partial fulfillment of the requirements for the award of the degree of **Bachelor of Technology (B.Tech)** in Computer Science and Engineering is a record of an original work done by us under the guidance of **Mrs. A. Durga Bhavani, Assistant Professor** and this project work have not been submitted to any other university for the award of any other degree or diploma.

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ABSTRACT

If you have driven before, you've been drowsy at the wheel at some point. It's not something we like to admit but it's an important problem with serious consequences that needs to be addressed. 1 in 4 vehicle accidents are caused by drowsy driving and 1 in 25 adult drivers report that they have fallen asleep at the wheel in the past 30 days. The scariest part is that drowsy driving isn't just falling asleep while driving. Drowsy driving can be as small as a brief state of unconsciousness when the driver is not paying full attention to the road. Drowsy driving results in over 71,000 injuries, 1,500 deaths, and $12.5 billion in monetary losses per year. Due to the relevance of this problem, we believe it is important to develop a solution for drowsiness detection, especially in the early stages to prevent accidents.Additionally,we believe that drowsiness can negatively impact people in working and classroom environments as well. Although sleep deprivation and college go hand in hand, drowsiness in the workplace especially while working with heavy machinery may result in serious injuries similar to those that occur while driving drowsily. Our solution to this problem is to build a detection system that identifies key attributes of drowsiness and triggers an alert when someone is drowsy before it is too late. Driver drowsiness detection is a car safety technology which helps prevent accidents caused by the driver getting drowsy. Various studies have suggested that around 20% of all road accidents are fatigue-related, up to 50% on certain roads. Uses computer vision to observe the driver's face, either using a built-in camera or on mobile devices.

CONTENTS

1. INTRODUCTION

"Drowsy driving" occurs when a person who is operating a motor vehicle is too tired to remain alert. As a result the driver may have slow reaction times, reduced vigilance and impaired thinking. In the worst case the driver may fall asleep behind the wheel. Various studies have suggested that around 20% of all road accidents are fatigue-related, up to 50% on certain roads. Uses computer vision to observe the driver's face, either using a built-in camera or on mobile devices.

A sleepy driver is arguably much more dangerous on the road than the one who is speeding as he is a victim of micro-sleeps. Automotive researchers and manufacturers are trying to curb this problem with several technological solutions that will avert such a crisis. If the eye aspect ratio indicates that the eyes have been closed for a sufficiently long enough amount of time, we'll sound an alarm to wake up the driver

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1.1. MOTIVATION

Sleep related crashes have received increasing attention during the last decade. During the last years there has been an increased interest in developing driver support systems that identify sleepiness. These systems normally consist of sensors for measuring physiological and behavioral changes, as well as algorithms to quantify such changes and predict risks. Lots of efforts have been addressed to this area. However, less effort has been targeted at the warning strategies, and how to provide the driver with feedback and/or a warning in a way that the sleepy driver considers the received signals and actually does something to resolve the problem. It is important, however, that the effectiveness of the feedback/warning should be considered in relation to user acceptance in order to make a real step forward. Even the most sensitive algorithm or detection system will do no good if the driver does not understand or accept the warning. It is difficult to evaluate the effect of a given warning and eliminate confounding factors. Different experimental settings like driving simulators, experimental vehicles, but also environments like test tracks or real roads can be used for the evaluation of the effect of warnings addressed to sleepy drivers. For each of them there is a relation between the realism of the situation and the possibility of controlling the test scenario and confounding factors.

1.2. PROBLEM STATEMENT

Drowsy driving occurs when a person who is operating a motor vehicle is too tired to remain alert. Drowsy driving often goes unreported when police complete an accident report. Unless the driver admits falling asleep, drowsy driving can be difficult to detect. Sleep related crashes have received increasing attention during the latest decade. Driver drowsiness detection is a car safety technology which helps prevent accidents caused by the driver getting drowsy. We'll implement the drowsiness detection algorithm detailed above using OpenCV, dlib, and Python. Our solution to this problem is to build a detection system that identifies key attributes of drowsiness and triggers an alert when someone is drowsy before it is too late.

1.3. OBJECTIVES

Various studies have suggested that around 20% of all road accidents are fatigue-related, up to 50% on certain roads. Uses computer vision to observe the driver's face, either using a built-in camera or on mobile devices. A sleepy driver is arguably much more dangerous on the road than the one who is speeding as he is a victim of micro-sleeps. Automotive researchers and manufacturers are trying to curb this problem with several technological solutions that will avert such a crisis. If the eye aspect ratio indicates that the eyes have been closed for a sufficiently long enough amount of time, we'll sound an alarm to wake up the driver.

2. LITERATURE SURVEY

Driver drowsiness is a major cause of road accidents. Therefore, much research has been done in order to develop precise monitoring systems to increase transportation safety and decrease the number of deaths caused by fatigued drivers. The methods for assessing driver drowsiness are generally related to the measurement of the driver's state, driver performance and a combination of the driver's state and performance. For each method, different criteria must be analyzed, for example yawning, head position and eye closure can be studied in a driver's state measurement, while lane tracking and tracking distances between vehicles are involved in the studies of a driver's performance. Based on the result of different researches, the most accurate technique towards driver fatigue detection is dependent on physiological phenomena like brain waves, heart rate, pulse rate and respiration. But these techniques are intrusive and require the attachment of some electrodes on the driver, which are likely to cause annoyance to him/her. Therefore, to monitor the driver's vigilance, different techniques of computer vision can be used, which are natural and non-intrusive. These techniques focus on observable visual behaviours from changes in a human's facial features like eyes, head and face.The objective measure of how the vehicle is being controlled by the driver is a key component of the driver's performance. These measures are the least invasive way of detecting driver state since there are no direct interactions with the driver. But on the other hand, these measures are a direct result of the driver's input to the vehicle's control, such as steering, throttle and brake. Vehicles are gradually equipped with systems for detecting driver metrics; therefore these measures are particularly suitable. The driver metrics consist of lane position, headway and steering wheel angle. Driver performance can be influenced by many factors, such as experience, distraction and driving conditions; therefore, driving performance is not necessarily closely correlated with driver state. A number of studies about the driver's performance have been done by other researchers, which have mainly employed lane tracking and also tracking of the distance between the driver's vehicle and the car in front.

Tuncer et al. proposed an assistant system to track a lane, which will be activated for those drivers who are not able to perform a good job of lane keeping. In order to develop the lane keeping controller system, a series of robust, parameter space based and velocity scheduled control design techniques were carried out, using the Control of Mechatronics Systems toolbox. For lane detection and lane tracking, a camera based image processing algorithm is required, which will use offline and real time hardware-in-the-loop simulations. In order to process the video frames coming from an in-vehicle camera pointed towards the road ahead, a PC is used that detects and computes the tracking of the lane, which it does by carrying out the fitting of composite Bezier curves to the curved lanes. In the next step, a dSpace microautobox is used to obtain the lane data from the PC and the Carmaker vehicle data from the dSpace compact simulator. It will then calculate the required steering actions and send them to the Carmaker vehicle model.

In the drowsiness detection method proposed by Pilutti et al. , driver assessment is determined in the context of a road departure warning and intervention system. In this method, the vehicle lateral position is used as the input and steering wheel position as the output in order to develop a system that will be updated during driving. The driver's performance will be determined by analyzing the changes in the bandwidth and/or parameters of such a model.Any physical changes that occur within the body during the onset of fatigue are considered to be physiological measures, which are a direct measure of fatigue. In general, different physiological measures have been used in attempts to detect tiredness, such as heart rate and body temperature. The electroencephalogram is another physiological concept that has become widely accepted as key for determining a person's state with respect to sleepiness and wakefulness. An electroencephalogram offers an objective degree of sleepiness that can be obtained in real time; therefore, it is one of the most promising tools for detecting driver fatigue. Electroencephalogram was the emphasis of the literature review of physiological measures because it is viewed as the most precise physiological measure of drowsiness.

The activity in the brain can be determined by electroencephalographic measurements. The brain's level of alertness will be changed by electrical activity, which allows the detection of sleepiness and different stages of sleep. In the paper proposed by Picot, a fatigue detection system is based on brain and visual activity. A single electroencephalographic channel is used in order to monitor the brain activity for drowsiness detection. The measurement of electrical activity of the brain—electroencephalographic—will be determined by placing the electrodes on the scalp. Electroencephalographic data can be analyzed where rhythmic activities are calculated in several physiologically significant frequency bands in the frequency domain. In order to detect drowsiness, any change in α, θ and β will be analyzed in electroencephalographic data, for example, an increase of the α and θ activities and a decrease of the β activity. α and θ are linked to relaxed and eyes closed states and β is linked to active concentration. The main goal of the electroencephalographic based detection system is to detect important variations of activity in the appropriate frequency ranges. Visual activity is detected through blinking detection and characterization. Cascading decision rules are then used to merge both brain and visual information according to a medical scale of drowsiness evaluation. Merging detection systems allows the fatigue detection system to detect three levels of drowsiness: “awake,” “drowsy” and “very drowsy.” Furman et al.method analyzed driver fatigue conditions by using an electrocardiography based approach. For their experiment, electrocardiography, electroencephalography, electromyography, eye movement and video of ten participants were recorded while they were asked to alternately undergo a Maintenance of Wakefulness Test or a Driving Simulation Test every two hours. In the falling asleep condition, the Heart Rate Variability (HRV) in the very low frequency range decreases consistently a few minutes before complete sleep occurs. The results obtained by their experiments suggested that derived parameters in the time and time-frequency domains may offer a suitable device for monitoring drivers' drowsiness.

According to Shan and Bowlds’ technique, a pulse wave sensor is used to detect a driver’s drowsiness . The mentioned sensor measures the heart pulse wave from the driver’s palm. The technique next employs an adaptive filter to cancel the measurement noise produced by the change of the gripping force. The sensor, along with the adaptive filter, is provided a clear heart pulse wave for later heart rate variability analysis. By utilizing the power spectrum density of the subjects’ heart rate time series, the low frequency to high frequency (LF/HF ratio) can be measured. The result of the LF/HF ratio indicates decreasing trends as drivers go from awake to drowsy.Hayashi et al. proposed another method of driver drowsiness detection by pulse wave analysis with a neural network. Since the biological signal such as pulse wave sharply reflects a human’s mental condition, this method is used to measure the driver’s awareness condition. In order to reduce noise signals by the driver’s movement, the sensor measuring the pulse wave was attached to the driver’s wrist. Three indexes from the obtained pulse wave will be evaluated, such as sympathetic nerve activity and parasympathetic nerve activity, from Heart Rate Variability analysis and will be given as an input to the neural network to determine the driver's state of drowsiness.

The ability of the driver to drive can be determined by the way he/she is behaving while behind the wheel. Behaviors indicative of tiredness or other unsafe driving situations such as distraction take the form of yawning, blinking, eyes closure, head movements, use of mobile devices and eye glance patterns.

The first step towards drowsiness detection based on behavioural features is to detect the driver's face. In this case, the search area for any facial feature will be reduced to the face region. There are numerous techniques towards face detection processing; images containing faces have been developed in different research categories such as face recognition, face tracking, pose estimation and expression recognition. To build a system that will be able to analyze the information included in face images, a robust and efficient face detection algorithm is required. The objective of face detection is to recognize all image regions that contain a face without considering its position, orientation and lighting conditions.

3. ANALYSIS

Analysis of the project is one of the most important phases of the project. The activity in this phase is to study the existing system and other is to understand the requirements and domain of the system. Both the activities have equal priorities but the first activity serves as a basis of given functional specifications and successful design.

3.1. EXISTING SYSTEMS

Method to measure driver drowsiness involves vehicle-based measurements. In most cases, these measurements are determined in a simulated environment by placing sensors on various vehicle components, including the steering wheel and the acceleration pedal; the signals sent by the sensors are then analyzed to determine the level of drowsiness. However, the two most commonly used vehicle-based measures are the steering wheel movement and the standard deviation of lane position.In summary, many studies have determined that vehicle-based measures are a poor predictor of performance error risk due to drowsiness. Moreover, vehicular-based metrics are not specific to drowsiness.In order to overcome the drawbacks of this system, we've designed this project.

3.2. PROPOSED SYSTEM

To counter the problems of the existing system,Driver drowsiness detection is a car safety technology which helps prevent accidents caused by the driver getting drowsy. We'll implement the drowsiness detection algorithm detailed above using OpenCV, dlib, and Python. Our solution to this problem is to build a detection system that identifies key attributes of drowsiness and triggers an alert when someone is drowsy before it is too late.

Drowsy driving results in over 71,000 injuries, 1,500 deaths, and $12.5 billion in monetary losses per year. Due to the relevance of this problem, we believe it is important to develop a solution for drowsiness detection, especially in the early stages to prevent accidents. Additionally, we believe that drowsiness can negatively impact people in working and classroom environments as well. Although sleep deprivation and college go hand in hand, drowsiness in the workplace especially while working with heavy machinery may result in serious injuries similar to those that occur while driving drowsily.Our solution to this problem is to build a detection system that identifies key attributes of drowsiness and triggers an alert when someone is drowsy before it is too late.

3.3. SOFTWARE REQUIREMENTS

3.3.1 PURPOSE

A common activity in most people's lives is driving; therefore, improving driving (making driving safe) is an important issue in everyday life. Even though the driver's safety is improving in road and vehicle design, the total number of serious crashes is still increasing. Reducing the number of car crashes would benefit millions of people around the world. Most of these crashes result from impairments of the driver's attention. There are four major types of attentional impairments that affect driver's reaction, and include alcohol, aging, distraction and fatigue. Approximately 40% of deaths from crashes in U.S. highways can be attributed to alcohol. Aging results in slower response to hazards. Drivers' distraction is increasing as vehicle technologies such as navigation systems, cell phones and the internet become more advanced. Compared with the above three impairments, fatigue is often cited in accidents since drivers tend to adopt risky strategies to drive at night.

3.3.2 SCOPE

Driver drowsiness pose a major threat to highway safety, and the problem is particularly severe for commercial motor vehicle operators. Twenty-four hour operations, high annual mileage, exposure to challenging environmental conditions, and demanding work schedules all contribute to this serious safety issue. Monitoring the driver’s state of drowsiness and vigilance and providing feedback on their condition so that they can take appropriate action is one crucial step in a series of preventive measures necessary to address this problem.

3.3.3 OVERALL DESCRIPTION

Driver fatigue not only impacts the alertness and response time of the driver but it also increases the chances of being involved in car accidents. National Highway Traffic Safety Administration(NHTSA) analysis data indicate that driving while drowsy is a contributing factor to 22 to 24% of car crashes, and that driving while drowsy results in a four- to six-times higher near-crash/crash risk relative to alert drivers. The near crash/crash risks of driver drowsiness may vary based on time of day or ambient lighting situations. Drowsiness is slightly increased when there is no high roadway or traffic demand and also in the darkness. A higher probability of drowsiness-related baseline epochs was identified during free-flow traffic densities, on divided roadways and areas free of roadway junctions. Drowsy driving denotes a situation when the driver is in a state of mental and physical fatigue, which includes decreasing mental alertness and a sensation of weariness and reduction in eye scanning behaviors. A severely drowsy driver will exhibit extended incompetence to safely perform a driving maneuver, be unaware of the vehicle’s turning radius, perform driving maneuvers under the incorrect assumption that it is safe, experience eyelid closures and have difficulties keeping his/her head in a lifted position, minimal body/eye movement and repeated yawning. When the driver is impaired by fatigue, his/her ability levels, driving behaviours, proficiencies and decisions are adversely affected and, in these situations, the high accident rate is due to the fact that sleepy drivers fail to take correct actions prior to a collision. An important irony in driver’s fatigue is that the driver may be too tired to realize his/her own level of drowsiness. This important problem is often ignored by the driver. Drowsy driving is a serious issue in our society not only because it affects those who are driving while drowsy, but because it puts all other road users in danger. Therefore, the use of assisting systems that monitor a driver’s level of vigilance is crucial to prevent road accidents. These systems should then alert the driver in the case of drowsiness or inattention.This requires computing relevant measures to predict the onset of drowsiness. After the detection of drowsiness, the system alerts the driver to take appropriate preventive action in order to avoid a serious car crash. The objective of this research is to develop an accurate and reliable system to detect a driver's drowsiness based on his or her yawning and eye closing.

4. DESIGN

4.1. UML DIAGRAMS

The Unified Modeling Language (UML) is a standard language for drawing software blue-prints. The UML is a language used for

a. Visualizing,

b. Specifying,

c. Constructing,

d. Artifacts documentation.

The UML is a language which provides vocabulary and the rules for combining words in that vocabulary for the purpose of communications. A modeling language is a language is a language whose vocabulary and the rules on the conceptual and physical representation of a system. Modeling yields an understanding of a system.

4.1.1 USE CASE DIAGRAM

A utilization case chart in the Unified Modeling Language (UML) is a sort of social defines characterized by way of and crafted from a use-case research. Its motivation is to display a graphical diagram of the usefulness given by way of a framework regarding acting artists, their goals, and any conditions between the ones usage cases. The main aim of the use case diagram is to illustrate what framework capacities are carried out from which performer.

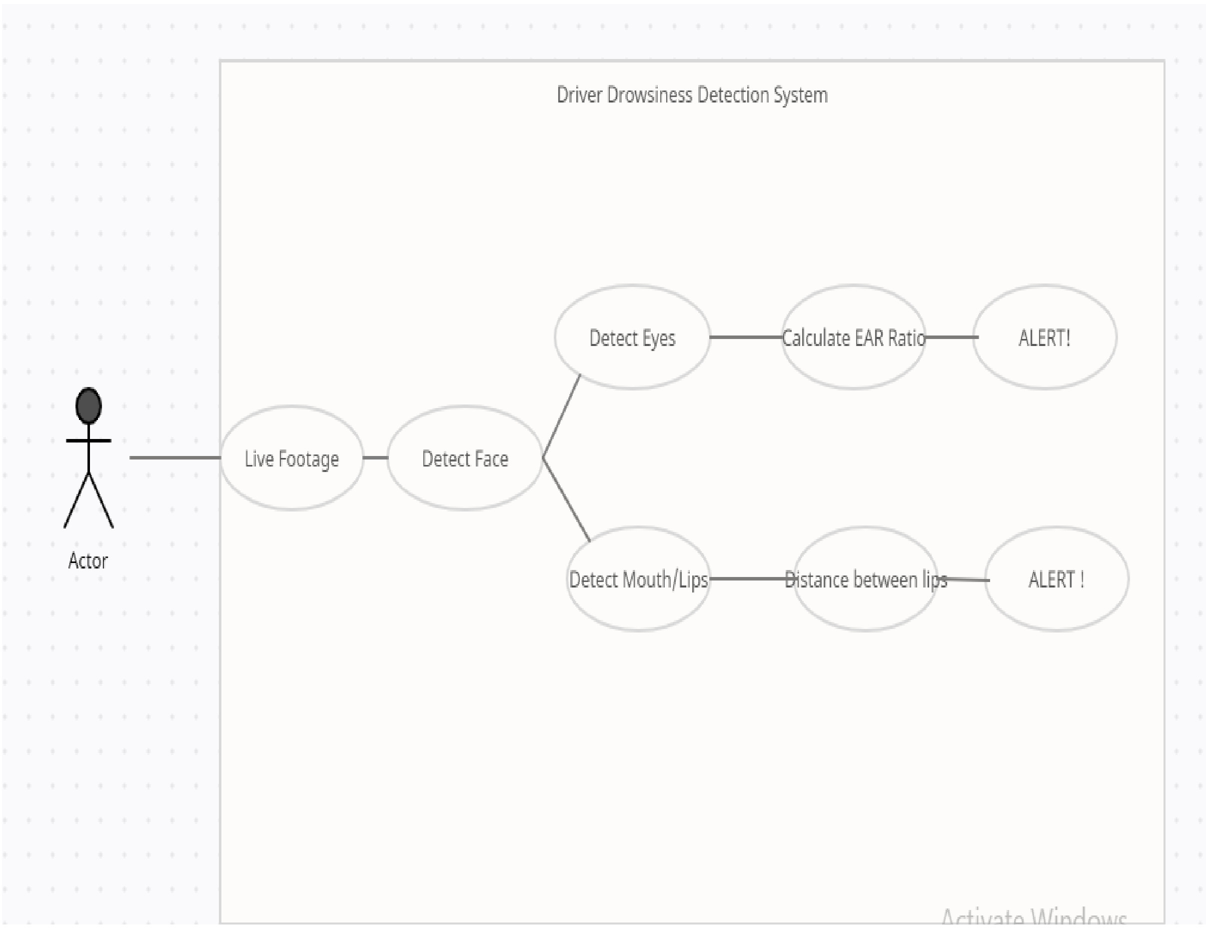


Fig 4.1.1 Use Case Diagram

4.1.2 SEQUENCE DIAGRAM

A sequence diagram is the most commonly used interaction diagram. An interaction diagram is used to show the interactive behavior of a system. We use different types of interaction diagrams to capture various features and aspects of interaction in a system.

A sequence diagram simply depicts interaction between objects in a sequential order i.e. the order in which these interactions take place. In sequence diagram there are different notations like actor, lifelines, messages etc.

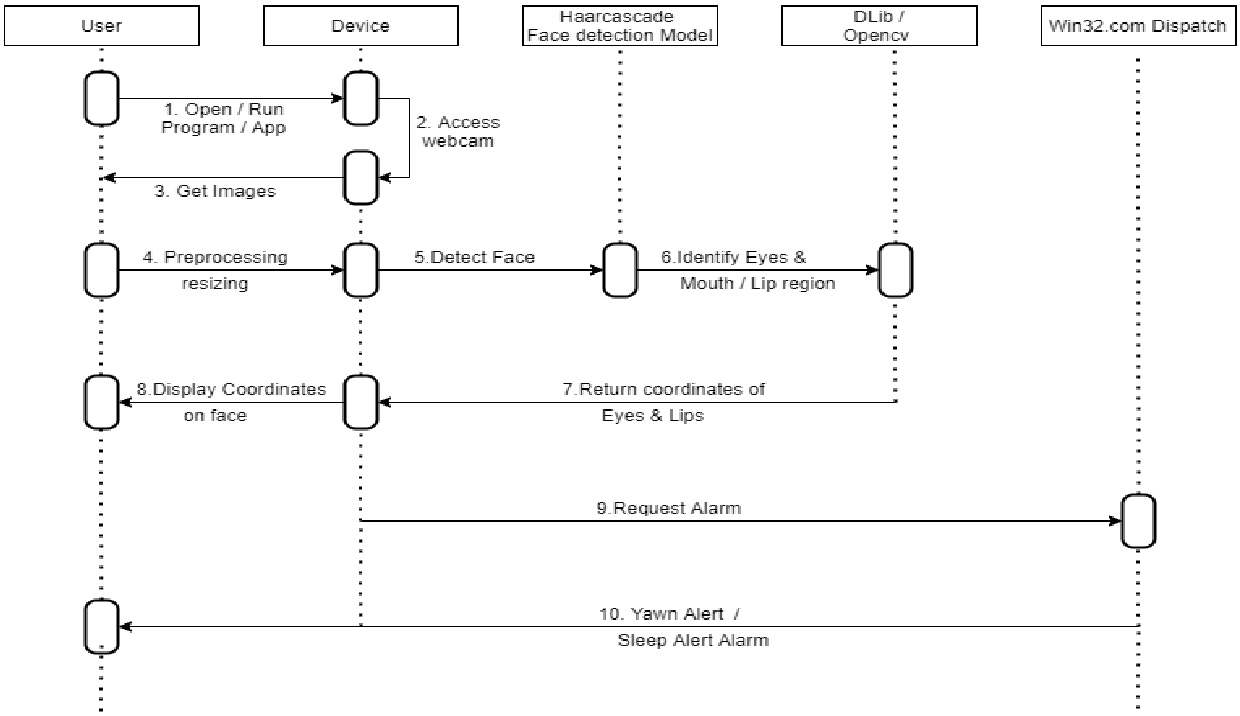
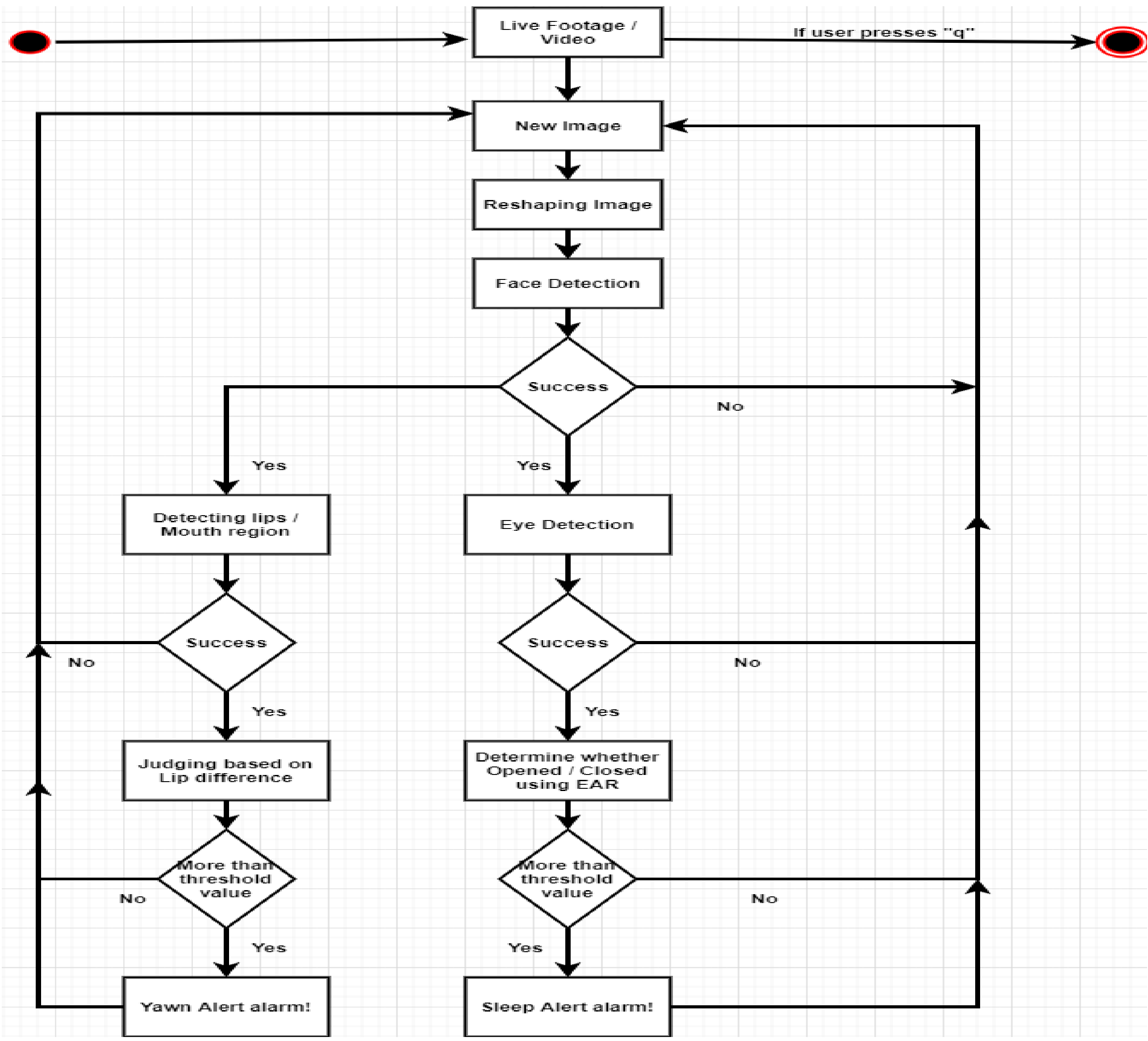


Fig 4.1.2. Sequence diagram

4.1.3 ACTIVITY DIAGRAM

An Activity diagram portrays the control flow from a start point to a finish point showing the various decision paths that exist while the activity is being executed.

We use Activity Diagrams to illustrate the flow of control in a system and refer to the steps involved in the execution of a use case. We model sequential and concurrent activities using activity diagrams. So, we basically depict workflows visually using an activity diagram. An activity diagram focuses on the condition of flow and the sequence in which it happens. We describe or depict what causes a particular event using an activity diagram.



5. IMPLEMENTATION

In this Python project, we will be using OpenCV for gathering the images from a webcam and feed them into a *Deep Learning* model which will classify whether the person's eyes and mouth are 'Open' or 'Closed'. The approach we will be using for this Python project is as follows :

Step 1 – Take image as input from a camera.

Step 2 – Detect the face in the image and create a Region of Interest (ROI).

Step 3 – Detect the eyes and mouth from ROI and feed it to the ear function and lip distance function .

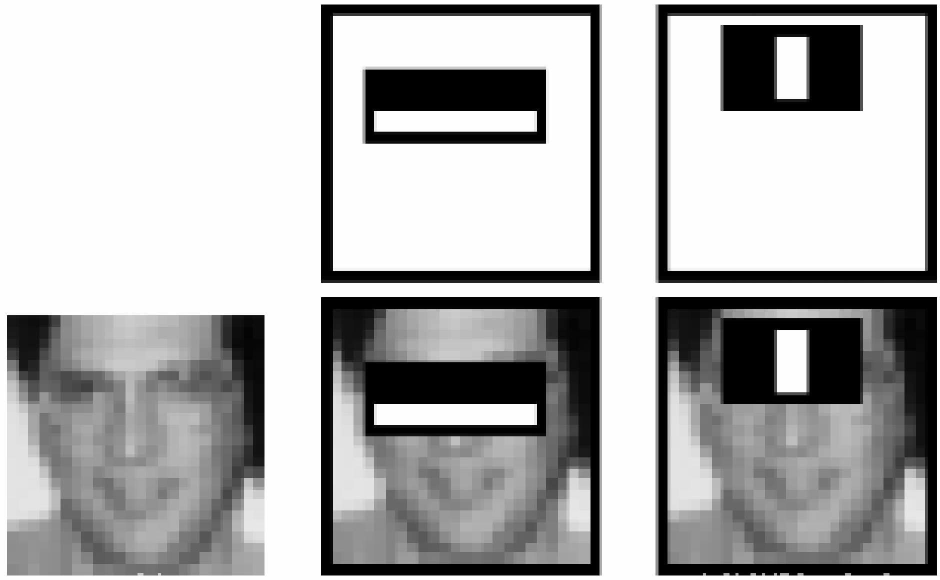
Step 4 – Functions will categorize whether eyes and mouth are open or closed.

Step 5 – Calculate score to check whether the person is drowsy or sleepy and generate Alarm.

5.2. MODULES USED

Haar-cascade Detection in OpenCV

Here we will deal with detection. OpenCV already contains many pre-trained classifiers for face, eyes, smile etc. Here we will work with face detection. Initially, the algorithm needs a lot of positive images (images of faces) and negative images (images without faces) to train the classifier. Then we need to extract features from it. For this, haar features shown in the below image are used. They are just like our convolutional kernel. Each feature is a single value obtained by subtracting the sum of pixels under white rectangle from the sum of pixels under black rectangle.



pywin32.com

The pywin32 package has been around for a very long time. In fact, the book that covers this topic was published in 2000 by Mark Hammond and Andy Robinson. Despite being 18 years old, the underlying technology and concepts still work today. Pywin32 is basically a very thin wrapper of python that allows us to interact with COM objects and automate Windows applications with python. The power of this approach is that you can pretty much do anything that a Microsoft Application can do through python. In this case we use this to generate alarm.

Dlib facial landmark detector

The pre-trained facial landmark detector inside the dlib library is used to estimate the location of *68 (x, y)-coordinates* that map to facial structures on the face.

The indexes of the 68 coordinates can be visualized on the image below:

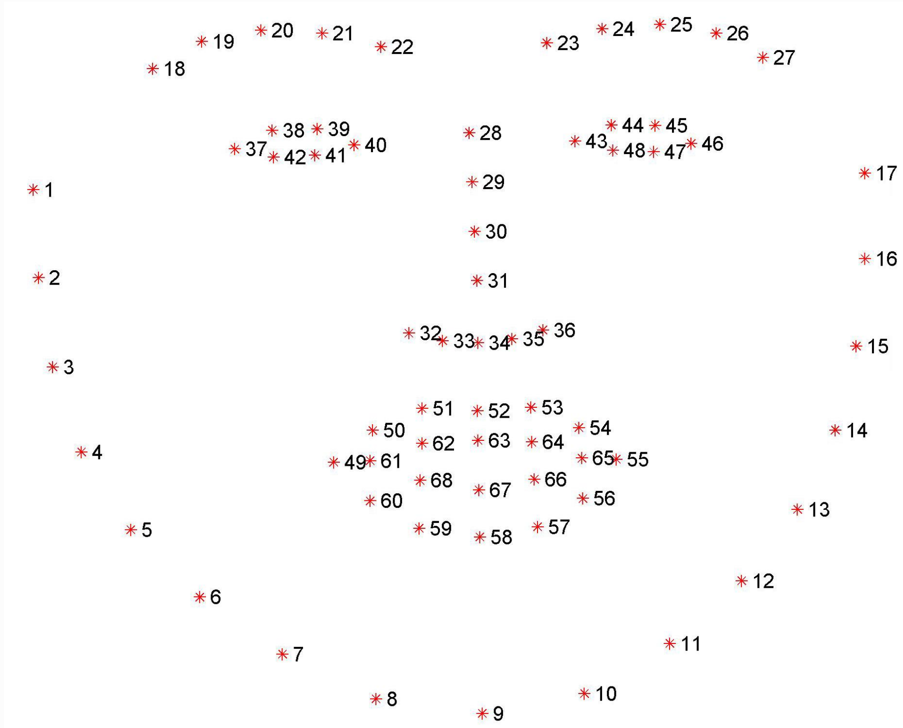


Figure 2: Visualizing the 68 facial landmark coordinates

Regardless of which dataset is used, the same dlib framework can be leveraged to train a shape predictor on the input training data — this is useful if you would like to train facial landmark detectors or custom shape predictors of your own

5.3. INTRODUCTION OF TECHNOLOGIES USED

5.3.1. PYTHON

Python is an interpreted, high-level and general-purpose programming language. Python's design philosophy emphasizes code readability with its notable use of significant whitespace. Its language constructs and object-oriented approach aim to help programmers write clear, logical code for small and large-scale projects. Python is dynamically-typed and garbage-collected. Most Python implementations (including CPython) include a read–eval–print loop (REPL), permitting them to function as a command line interpreter for which the user enters statements sequentially and receives results immediately. Other shells, including IDLE and IPython, add further abilities such as improved auto-completion, session state retention and syntax highlighting.

Fig 5.3.1. Python

5.3.2 Opencv

OpenCV (Open Source Computer Vision Library) is an open source computer vision and machine learning software library. OpenCV was built to provide a common infrastructure for computer vision applications and to accelerate the use of machine perception in commercial products.

The library has more than 2500 optimized algorithms, which includes a comprehensive set of both classic and state-of-the-art computer vision and machine learning algorithms. These algorithms can be used to detect and recognize faces, identify objects, classify human actions in videos, track camera movements, track moving objects, extract 3D models of objects, produce 3D point clouds from stereo cameras, stitch images together to produce a high resolution image of an entire scene

5.4. SOURCE CODE

```
from scipy.spatial import distance as dist
from imutils.video import VideoStream
from imutils import face_utils
from threading import Thread
import numpy as np
import argparse
import imutils
import time
import dlib
import cv2
#import os
from win32com.client import Dispatch
speak = Dispatch("SAPI.SpVoice").Speak



def alarm(msg):
    global alarm_status
    global alarm_status2
    global saying

    while alarm_status:
        print('call')
        speak(msg)
```

```
            ##os.system('espeak "()"'.format(msg))


        if alarm_status2:
            print('call')
            saying = True
            speak(msg)
            ##os.system('espeak "()"'.format(msg))
            saying = False


def eye_aspect_ratio(eye):
    A = dist.euclidean(eye[1], eye[5])
    B = dist.euclidean(eye[2], eye[4])

    C = dist.euclidean(eye[0], eye[3])

    ear = (A + B) / (2.0 * C)

    return ear


def final_ear(shape):
    (lStart, lEnd) = face_utils.FACIAL_LANDMARKS_IDXS["left_eye"]
    (rStart, rEnd) = face_utils.FACIAL_LANDMARKS_IDXS["right_eye"]

    leftEye = shape[lStart:lEnd]
```

```
    rightEye = shape[rStart:rEnd]

    leftEAR = eye_aspect_ratio(leftEye)
    rightEAR = eye_aspect_ratio(rightEye)

    ear = (leftEAR + rightEAR) / 2.0
    return (ear, leftEye, rightEye)

def lip_distance(shape):
    top_lip = shape[50:53]
    top_lip = np.concatenate((top_lip, shape[61:64]))

    low_lip = shape[56:59]
    low_lip = np.concatenate((low_lip, shape[65:68]))

    top_mean = np.mean(top_lip, axis=0)
    low_mean = np.mean(low_lip, axis=0)

    distance = abs(top_mean[1] - low_mean[1])
    return distance


ap = argparse.ArgumentParser()
ap.add_argument("-w", "--webcam", type=int, default=0,
```

```
                help="index of webcam on system")
args = vars(ap.parse_args())


EYE_AR_THRESH = 0.3
EYE_AR_CONSEC_FRAMES = 30
YAWN_THRESH = 20
alarm_status = False
alarm_status2 = False
saying = False
COUNTER = 0


print("-> Loading the predictor and detector...")
#detector = dlib.get_frontal_face_detector()
detector =
cv2.CascadeClassifier("haarcascade_frontalface_default.xml")
#Faster but less accurate
predictor =
dlib.shape_predictor('shape_predictor_68_face_landmarks.dat')


print("-> Starting Video Stream")
vs = VideoStream(src=args["webcam"]).start()
#vs= VideoStream(usePiCamera=True).start()       //For Raspberry Pi
time.sleep(1.0)
```

```
while True:

    frame = vs.read()
    frame = imutils.resize(frame, width=450)
    gray = cv2.cvtColor(frame, cv2.COLOR_BGR2GRAY)

    #rects = detector(gray, 0)
    rects = detector.detectMultiScale(gray, scaleFactor=1.1,
            minNeighbors=5, minSize=(30, 30),
            flags=cv2.CASCADE_SCALE_IMAGE)

    #for rect in rects:
    for (x, y, w, h) in rects:
        rect = dlib.rectangle(int(x), int(y), int(x + w),int(y +
h))

        shape = predictor(gray, rect)
        shape = face_utils.shape_to_np(shape)

        eye = final_ear(shape)
        ear = eye[0]
        leftEye = eye [1]
        rightEye = eye[2]

        distance = lip_distance(shape)
```

```
        leftEyeHull = cv2.convexHull(leftEye)

        rightEyeHull = cv2.convexHull(rightEye)

        cv2.drawContours(frame, [leftEyeHull], -1, (0, 255, 0), 1)

        cv2.drawContours(frame, [rightEyeHull], -1, (0, 255, 0), 1)


        lip = shape[48:60]

        cv2.drawContours(frame, [lip], -1, (0, 255, 0), 1)


        if ear < EYE_AR_THRESH:

            COUNTER += 1


            if COUNTER >= EYE_AR_CONSEC_FRAMES:

                if alarm_status == False:

                    alarm_status = True

                    t = Thread(target=alarm, args=('wake up',))

                    t.deamon = True

                    t.start()


                cv2.putText(frame, "DROWSINESS ALERT!", (10, 30),

                            cv2.FONT_HERSHEY_SIMPLEX, 0.7, (0, 0,
255), 2)


        else:

            COUNTER = 0
```

```
            alarm_status = False


        if (distance > YAWN_THRESH):
                cv2.putText(frame, "Yawn Alert", (10, 30),
                            cv2.FONT_HERSHEY_SIMPLEX, 0.7, (0, 0, 
255), 2)
                if alarm_status2 == False and saying == False:
                    alarm_status2 = True
                    t = Thread(target=alarm, args=('take some fresh 
air',))
                    t.deamon = True
                    t.start()
        else:
            alarm_status2 = False


        cv2.putText(frame, "EAR: {:.2f}".format(ear), (300, 30),
                    cv2.FONT_HERSHEY_SIMPLEX, 0.7, (0, 0, 255), 2)
        cv2.putText(frame, "YAWN: {:.2f}".format(distance), (300, 
60),
                    cv2.FONT_HERSHEY_SIMPLEX, 0.7, (0, 0, 255), 2)



    cv2.imshow("Frame", frame)
    key = cv2.waitKey(1) & 0xFF
```

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

cv2.destroyAllWindows()
vs.stop()
```

6. TEST CASES

6.1 TEST CASE

Test case is a set of conditions or variables under which a tester will determine whether a system under test satisfies or not.

6.1.1 UNIT TESTING

Unit testing is a level of software testing where individual units of software are tested. A unit is the smallest testable part of any software.

S.NO	Test case	Condition	Result
1.	Trying to predict the personality	Age between 15 and 30	Accurate Prediction
2.	Trying to predict the personality	Age below 15 or above 30	Partial Prediction
3.	Trying to predict the personality	Correct Input	Accurate Prediction
4	Trying to predict the personality	Incorrect Input	Inaccurate Prediction

7. SCREENSHOTS

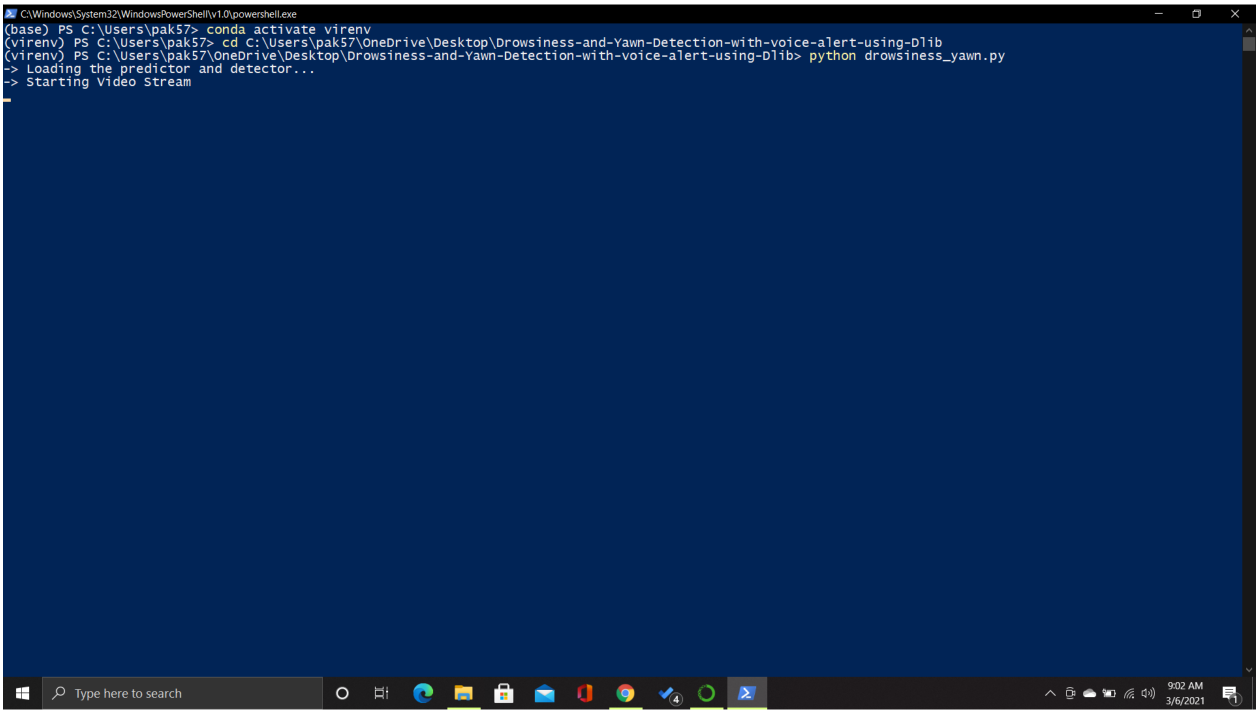


Fig 7.1. Running the model

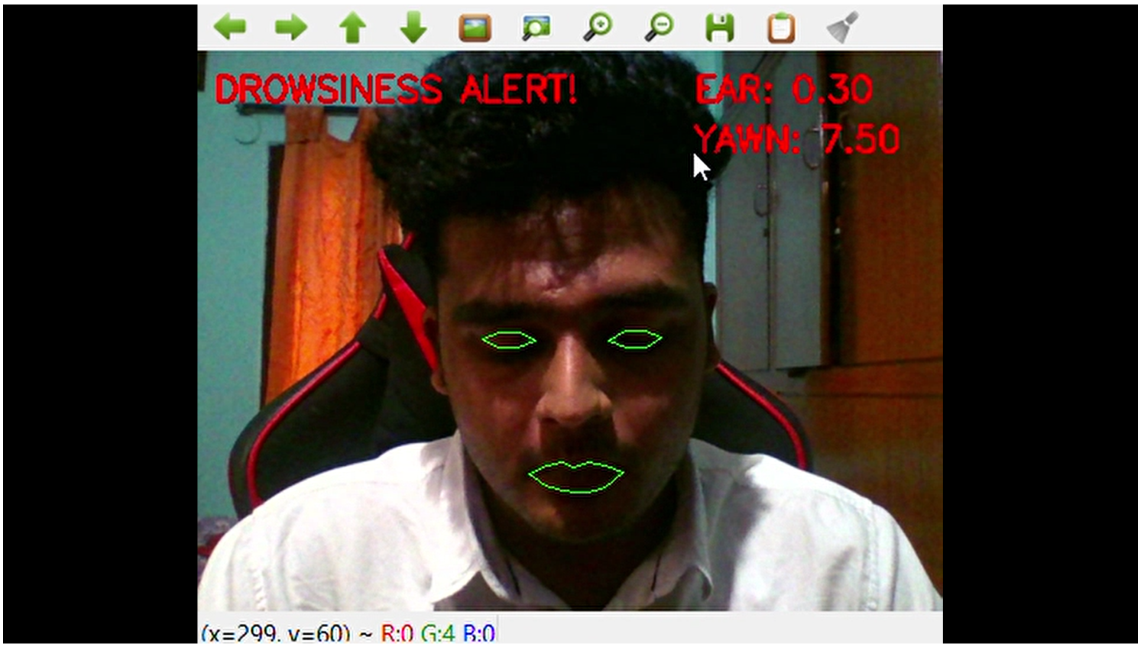


Fig 7.3. Predicting the output

8. CONCLUSION

The drowsiness detection and correction system developed is capable of detecting drowsiness in a rapid manner. The system which can differentiate normal eye blink and drowsiness which can prevent the driver from entering the state of sleepiness while driving.By doing this many accidents will be reduced and provides safe life to the driver and vehicle safety. The demonstration platform uses a small camera, which is the same as the camera that should be installed under the front mirror of a car in a practical scenario. The output of the camera will be processed in the embedded platform and the results of face and mouth tracking as well as yawning alert signal can be seen on the monitor that is connected to the system. To make the system work without a computer and only on a computationally limited embedded platform, much effort has been made in designing and optimizing algorithms and codes in order for them to work in real time and without requiring advanced hardware platforms.A system for driver safety and car security is presented only in the luxurious costly cars. Using drowsiness detection system, driver safety can be implemented in normal cars also

9. FUTURE ENHANCEMENT

The presented technique of detecting driver drowsiness had various limitations, which may be addressed as future work. The following recommendations have been made for future research on the detection of driver's drowsiness:According to the statistical report from NHTSA, in general, far fewer drowsiness related baseline epochs were recognized during the daylight hours while a greater number were observed during darkness; therefore, having a hybrid system that uses data from both the infrared and visible range will be more useful and necessary.Some drivers cover their mouth while yawning or they have different signs of sleepiness like eye closure or falling head; in this case, future work may consist of combining the detection of different fatigue signs.

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