REAL TIME DRIVER DROWSINESS DETECTION FOR INTELLIGENT TRANSPORTATION SYSTEM

MINI PROJECT-I REPORT

Submitted by

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of

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in

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KONGUNADU COLLEGE OF ENGINEERING AND TECHNOLOGY

(AUTONOMOUS)

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PROGRAM EDUCATIONAL OBJECTIVES (PEOs)

- **PEO I:** Graduates shall become IT professionals with specialization in Software Engineering, Networking, Data Mining and Cloud computing.
- **PEO II:** Graduates shall build IT solutions through analysis, design and development of software and firmware solutions for real-world problems and social issues.
- **PEO III:** Graduates shall have professional ethics, team spirit, life-long learning, good oral and written communication skills and adopt corporate culture, core values and leadership skills.

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- **PSO2: Competency:** Students shall qualify at the State, National and International level competitive examination for employment, higher studies and research.

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Engineering Graduates will be able to:

1. **Engineering knowledge**: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
2. **Problem analysis**: Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using the first principles of mathematics, natural sciences, and engineering sciences.
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4. **Conduct investigations of complex problems**: Use research-based knowledge and research methods including design of experiments, analysis, and interpretation of data, and synthesis of the information to provide valid conclusions.
5. **Modern tool usage**: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modelling to complex engineering activities with an understanding of the limitations.
6. **The engineer and society**: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.
7. **Environment and sustainability**: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.
8. **Ethics**: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
9. **Individual and team work**: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
10. **Communication**: Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.
11. **Project management and finance**: Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.
12. **Life-long learning**: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest.

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BONAFIDE CERTIFICATE

Certified that this mini project-I report titled "**REAL TIME DRIVER DROWSINESS DETECTION FOR INTELLIGENT TRANSPORTATION SYSTEM** "is a bonafide work of "**KATHIRVEL T (621321205022), SANTHOSH M (621321205048), SHAHIN ABDUL RAZACK T (621321205051)"** who carried out the mini project under my supervision.

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Submitted for the Mini Project-I viva-voce examination held on ………………

INTERNAL EXAMINER **EXTERNAL EXAMINER**

ABSTRACT

Driver drowsiness is a critical issue contributing to road accidents and fatalities worldwide. The Real time driver drowsiness detection for an intelligent transportation system can detect the driver drowsiness in real time, enhancing transportation and road safety. To address this problem, a robust and efficient Driver Drowsiness Detection System is proposed. The primary objective of this system is to detect signs of driver drowsiness and issue timely alerts to prevent potential accidents. The proposed approach involves some image preprocessing techniques like data collection, noise reduction and feature extraction. Face recognition is determined by using Haar Cascade algorithm and the utilization of machine learning algorithms like SVM to process eye movement in real-time video streams. This system uses eye landmarks which determine the EAR (Eye Aspect Ratio ratio) to check whether the driver is drowsy. To make this system user friendly by adding Graphical user Interface (GUI) using Tkinter.

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LIST OF ABBREVIATIONS

EAR	-	**E**YE **A**SPECT **R**ATIO
GUI	-	**G**RAPHICAL **U**SER **I**NTERFACE
SVM	-	**S**UPPORT **V**ECTOR **M**ACHINE
OPENCV	-	**O**PENSOURCE **C**OMPUTER **V**ISION
D-LIB	-	**D**IGITAL **L**IBRARY
MAR	-	**M**OUTH **A**SPECT **R**ATIO

CHAPTER 1

INTRODUCTION

The number of motor vehicles in developing countries has been gradually increased over the decade. Official investigation reports of traffic accidents point out that dangerous driving behaviour, such as drunk and drowsy driving, accounts for a high proportion of accidents [9]. Most of the accidents related to driver drowsiness occur around 2:00-6:00 a.m. and 14:00-16:00, and it is often pointed out that night shifts make drivers particularly vulnerable [2]. Additionally, it is evident from the research that driver fatigue is also one of the major causes of road accidents. Different countries have different statistics for accidents that occurred due to driver fatigue. Driver drowsiness is a serious problem and major concern, which is identified as a direct or contributing cause in most of the road accidents. Since drowsiness can seriously slow down the reaction time and subsequently decreases drivers awareness and judgment. The development of a driver monitoring system capable of producing warning to the driver upon detecting signs of drowsiness can prevent road accidents and thus save lives. From another prospective, image processing gained popularity in computer science engineering, selected fields which has impacted in multi-dimensional way [4]. If image processing technique are used for drowsiness detection, it can simultaneously reduce road accidents promise scheme which detect driver drowsiness with help of image processing such as eye blink count [8]. observation of the driver behavior method may be determined by continuous recording through a camera installed in the vehicle to monitor eye-closure time, eye blinking frequency, movement and pose of the head, and yawing [11].

1.1 OVERVIEW

A driver drowsiness detection project utilizing machine learning techniques aims to enhance road safety by identifying signs of driver fatigue in real-time. The project typically involves the collection of relevant data, including facial expressions, eye movements, and physiological signals, which is then preprocessed and transformed into meaningful features. Leveraging machine learning algorithms, such as deep learning models, the system is trained to recognize patterns associated with drowsiness. Through continuous monitoring and analysis of the driver's behavior, the system can issue timely alerts or warnings to prevent potential accidents. Robust performance evaluation and integration with existing transportation systems are crucial aspects, ensuring the system's reliability and effectiveness in mitigating the risks posed by driver drowsiness on the road.

1.2 PROBLEM STATEMENT

Despite numerous safety measures in modern vehicles, the prevalence of accidents caused by driver drowsiness remains a significant concern, leading to loss of life and property. Existing driver monitoring systems often lack the capability to accurately detect early signs of driver fatigue, posing a serious threat to road safety. This project aims to develop an efficient and reliable driver drowsiness detection system using machine learning techniques, capable of real-time monitoring and timely intervention to mitigate the risks associated with drowsy driving, thereby significantly reducing the incidence of accidents caused by driver fatigue.

CHAPTER 2

LITERATURE SURVEY

[1] TITLE: Various Methods for Driver Drowsiness Detection.

AUTHOR: Bhatt, P.P., and Trivedi, J.A.

PUBLICATION YEAR: 2017

The comprehensive analysis of driver drowsiness detection techniques presented in the literature involves a multi-dimensional approach, including monitoring steering patterns through a steering angle sensor, tracking vehicle position in the lane using cameras, employing driver eye and face monitoring systems to detect physical and mental signs of drowsiness and distraction, utilizing physiological measurements such as ECG, EEG, and EOG to identify early markers of fatigue, implementing optical detection methods to analyze blink rates and facial features, utilizing yawning as an indicator of drowsiness, employing eye state and blinking frequency analysis, and incorporating head position detection technologies to alert drivers when their head tilt exceeds certain thresholds. Collectively, these approaches illustrate the diverse array of strategies researchers have adopted to ensure timely and accurate identification of driver drowsiness, thereby enhancing road safety and preventing potential accidents.

[3] TITLE: Deep CNN Models-Based Ensemble Approach to Driver Drowsiness Detection

AUTHOR: Dua, M., Singla, R., Raj, S., and Jangra, A.

PUBLICATION YEAR: 2020

This paper proposes a hierarchical CNN - LSTM based model for detecting driver drowsiness. It provides a detection performance slightly inferior to state of the art deep learning models, whereas it is computationally advantageous over those models. It can be applicable with commercial development boards with a frame rate of 5 to 10 fps and frame resolution of 480 ×640.The proposed model can be further improved in two ways. Firstly, a more effective face detector can be used instead of Dlib library, which is not robust against varying driver poses. Moreover, developing a new head detection algorithm would be more efficient since the driver pose varies a lot in training videos.

[5] TITLE: Real-Time Driver Drowsiness Detection for Android Application Using Deep Neural Networks Techniques

AUTHOR: Jabbar, K.A., Khalifa, K., Kharbeche, M.

PUBLICATION YEAR: 2018

This paper proposes a drowsiness detection system based on multilayers perceptron classifiers. It is specifically designed for embedded systems such as Android mobile. The role of the system is to detect facial landmark from images and deliver the obtained data to the trained model to identify the driver's state. The purpose of the method is to reduce the model's size considering that current applications cannot be used in embedded systems due to their limited calculation and storage capacity. According to the experimental results, the size of the used model is small while having the accuracy rate of 81%. Hence, it can be integrated into advanced driver-assistance systems, the Driver drowsiness detection system, and mobile applications. However, there is still space for the performance improvement. The further work will focus on detecting the distraction and yawning of the driver

[6] TITLE: Real-Time Driver Drowsiness Detection System Using Eye Aspect Ratio and Eye Closure Ratio

AUTHOR: Mehta, S., Dadhich, S., Gumber, S., and Bhatt, A.J.

PUBLICATION YEAR: 2019

In this work, a real time system that monitors and detects the loss of attention of drivers of vehicles is proposed. The face of the driver has been detected by capturing facial landmarks and warning is given to the driver to avoid real time crashes. Non-intrusive methods have been preferred over intrusive methods to prevent the driver from being distracted due to the sensors attached on his body. The proposed approach uses Eye Aspect Ratio and Eye Closure Ratio with adaptive thresholding to detect driver's drowsiness in real-time. This is useful in situations when the drivers are used to strenuous workload and drive continuously for long distances. The proposed system works with the collected data sets under different conditions. The facial landmarks captured by the system are stored and machine learning algorithms have been employed for classification.

[7] TITLE: Driver Drowsiness Detection Using Behavioral Measures and Machine Learning Techniques: A Review of State-of-Art Techniques

AUTHOR: Ngxande, M., Tapamo, J.R.

PUBLICATION YEAR: 2017

There are many techniques that are based on behavioral methods and machine learning that can be utilized for the purpose of driver drowsiness detection. This paper presented a survey of approaches to driver drowsiness detection using machine learning techniques and discussed the range of features and measures used for classification. The main goal of these systems is to detect a slight change in a driver's facial expression that contains drowsiness information. Although there are different methods that can be used to measure the level of drowsiness (vehicle-based, physiological, and behavioral methods), this review has focused on behavioral methods because they are non-invasive, work in various light conditions and do not necessarily require vehicle modifications. Machine learning techniques such as SVM, CNN, and HMM are reviewed in this paper. Unfortunately, it is extremely difficult to compare these approaches as there is a limited number of standardized datasets that are currently exists to do so.

CHAPTER 3
SYSTEM ANALYSIS

3.1 EXISTING SYSTEM

By using a non-intrusive machine vision based concepts, drowsiness of the driver detected system is developed. Many existing systems require a camera which is installed in front of driver. It points straight towards the face of the driver and monitors the driver’s eyes in order to identify the drowsiness. Bus has a large front glass window to have a broad view for safe driving. If we place a camera on the window of front glass, the camera blocks the frontal view of driver so it is not practical. If the camera is placed on the frame which is just about the window, then the camera is unable to detain the anterior view of the face of the driver correctly. PCA based method which was used earlier for eye/face detection failed as it does not support night driving conditions and has a lower accuracy rate. So to overcome this drawback LBPH algorithm is used. The CNN, DNN based technique used for face recognition doesn’t support real time face recognition and also has a lower accuracy rate. The open CV detector detects only 40% of face of driver in normal driving position in video recording of 10 minutes. In the oblique view, the Open CV eye detector (CV-ED) frequently fails to trace the pair of eyes.

3.1.1 DISADVANTAGES

- Few of the models don’t support night driving conditions or glasses,etc.
- Only few systems support real-time face recognition.

3.2 PROPOSED SYSTEM

The proposed system for a driver drowsiness detection system incorporates advanced technologies to enhance road safety. By leveraging computer vision techniques and machine learning algorithms, the system monitors the driver's facial expressions, eye movements, and Yawning to detect signs of drowsiness. Real-time data from cameras inside the vehicle feed into the system, Then the data is preprocessed and then by using Harr-Cascade algorithm face recognition is done. By Eye Aspect Ratio (EAR) the openness of the eye is checked. Then the Mouth Aspect Ratio is used to check the openness of the mouth for yawning, which then analyzes the collected information to determine the driver's level of alertness. In the event of detecting drowsiness, the system triggers alerts such as auditory warnings to prompt the driver to regain focus.

3.2.1 ADVANTAGES

- Better accuracy rate will be produced.
- In this system also detects y awning to determine drowsiness of a driver.
- Timely alert will be ringed in the event of detecting the drowsiness.
- This system utilizes advanced technologies, enabling it to adapt to various driving conditions and individual driver behavior ensuring reliable and accurate detection.
- Implementing this system in real time may reduce the risk of accidents caused due to driver drowsiness.

CHAPTER 4
SYSTEM DESIGN

4.1 UML DIAGRAMS

UML diagrams aid in the systematic design and planning of the system, enabling the identification of key components, their interactions, and the flow of data and processes. It also assist in analyzing the system's behavior and communication patterns, which is essential for assessing its performance and ensuring its efficient functioning. Furthermore, these diagrams serve as comprehensive document

4.1.1 ACTIVITY DIAGRAM

The activity diagram serves as a valuable tool in the driver drowsiness detection system project, aiding in the visualization and understanding of the workflow and activities involved in the system's operation. By depicting the sequential steps, decision points, and process logic, the activity diagram clarifies the various stages of data collection, preprocessing, feature extraction, model training, real-time monitoring, and alert generation.

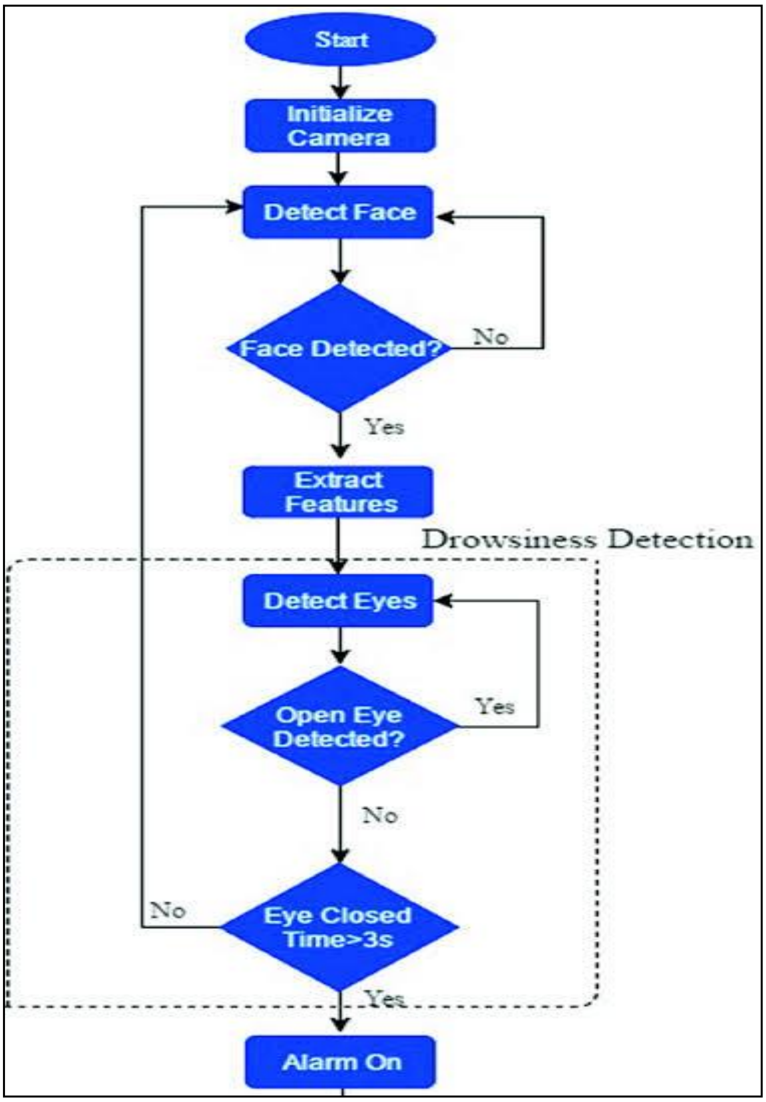

Fig4.1.1: Activity Diagram of proposed approach

CHAPTER 5

SYSTEM IMPLEMENTATION

The implementation of a driver drowsiness detection system encompasses the integration of hardware and software components, as well as the incorporation of machine learning algorithms for accurate drowsiness assessment. This process starts with selecting and configuring the necessary hardware, like cameras within the vehicle. Software development involves creating modules for real-time data acquisition, preprocessing, feature extraction, and machine learning model integration.

5.1 SYSTEM ARCHITECTURE

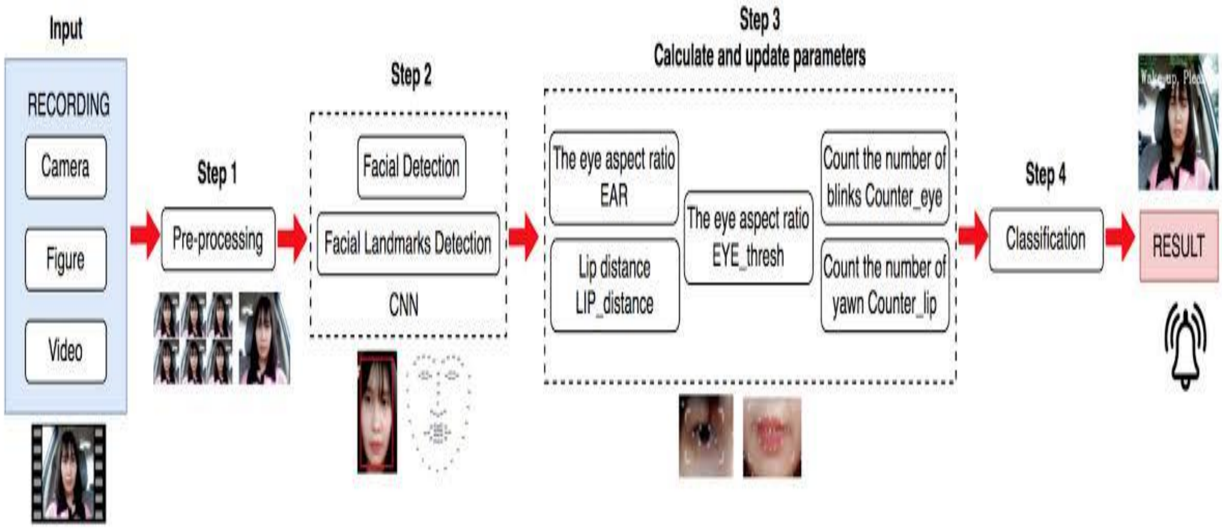

Fig 5.1.1: System Architecture of proposed approach

5.1.1RESEARCH METHODOLOGY

This section details the proposed approach to detect driver's drowsiness that works on two levels. The face is detected from a video stream using facial landmark detection and extract the eye regions. These facial landmarks are then used to compute the EAR and are returned back to the driver. In our context, the EAR value received at the application's end would be compared with the threshold value taken as 0.3. If the EAR value is less than the threshold value, then this would indicate a state of fatigue. In case of Drowsiness, the driver and the passengers would be alerted by an alarm.

5.1.2WORK FLOW

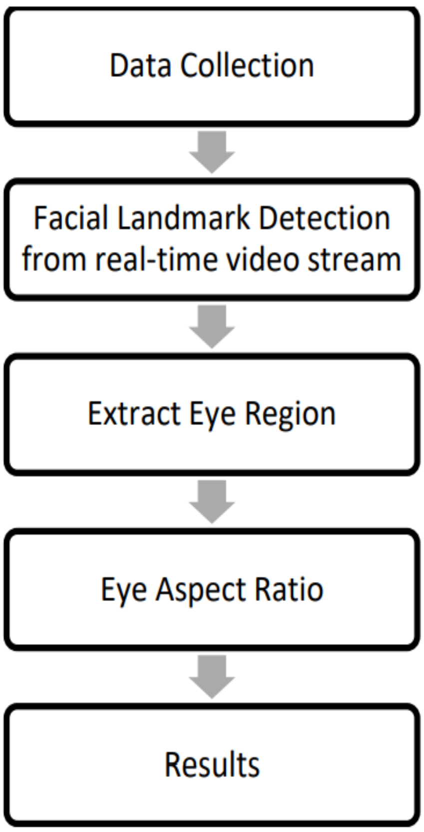

Fig5.1.2: Work Flow of proposed approach

5.1.3 DATA COLLECTION AND PREPROCESSING

OpenCV is used to immediately record data from a webcam for this research investigation. Face detection is constant from webcam video stream. The areas of the face, such as the eyes, eyebrows, nose, mouth, and jawline, are localized and represented using facial landmarks. Facial landmarks have been effectively used for blink detection, face switching, Yawning.

5.1.4 EXPERIMENTAL SETUP

Face detection can be achieved in several ways. OpenCV's built-in Haar cascades can be used. Given the face region then Step-2 can be applied that is detecting key facial structures in the face region. There are a variety of facial landmark detectors, but all methods essentially try to localize and label the following facial regions: mouth, right eyebrow, left eyebrow, right eye, left eye, nose, jaw. This method starts with a training set of labeled facial landmarks on an image. 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 EAR involves a very simple calculation based on the ratio of distances between facial landmarks of the eyes. This method for eye blink detection is fast, efficient, and easy to implement. In our drowsiness detector case, the EAR is monitored to check if the value falls below the threshold value, and also it does not increase again above the threshold value in the next frame. The above condition implies that the person has closed his/her eyes and is in a drowsy state. Then an auditory alarm will be ringed to alert the driver an to regain the focus on driving.

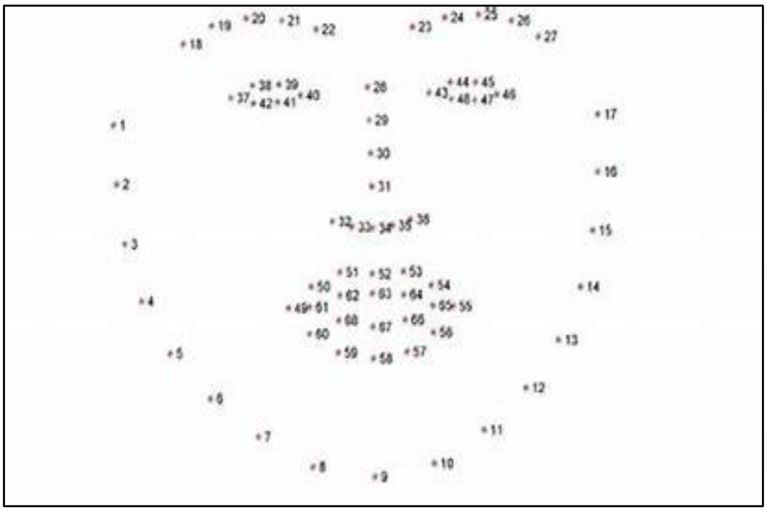

Fig5.1.3: Visualizing the 68 facial landmark coordinates

5.1.5 EYE ASPECT RATIO

The EAR involves a very simple calculation based on the ratio of distances between facial landmarks of the eyes. This method for eye blink detection is fast, efficient, and easy to implement. Each eye is represented by 6 *(x,y)*-coordinates, starting at the left corner of the eye. (Based on the work by Patel et. al. 2018). EAR is defined as the ratio of height and width of the eye and was computed using Equation,

$$\text{EAR}=\frac{||p2-p6||+||p3-p5||}{2||p1-p4||}$$

The numerator computes the height of the eye i.e. the distance between the vertical eye landmarks. The denominator computed the width of the eye i.e. the distance between horizontal eye landmarks. Where *p1, p2, p3, p4, p5, p6* are 2D facial landmark locations.

Fig5.1.4: Ear Aspect Ratio

In our drowsiness detector case, the EAR is monitored to check if the value falls below the threshold value, and also it does not increase again above the threshold value in the next frame. The above condition implies that the person has closed his/her eyes and is in a drowsy state. On the contrary, if the EAR value increases again, it implies that the person has just blinked the eye and there is no case of drowsiness.

5.2 MODULE SPECIFICATIONS

1. Data Preprocessing Module
2. Feature Extraction Module
3. Drowsiness Detection Module

5.2.1 DATA PREPROCESSING MODULE

The data preprocessing module in the driver drowsiness detection system plays a critical role in preparing and refining the raw input data for subsequent analysis and model training. This module involves a series of essential steps to ensure the quality, consistency, and suitability of the data for the machine learning algorithms. Firstly, the module standardizes the input data, including facial images or video frames, by resizing them to a uniform dimension for uniform processing. Then, it applies techniques such as noise reduction and image enhancement to improve the clarity and quality of the input data. Facial feature extraction methods are employed to isolate and extract crucial features, including eye regions, facial landmarks, and head positions, that are essential for drowsiness detection. Additionally, the module normalizes the data to remove any biases or variations in illumination, ensuring that the system can accurately interpret the driver's facial expressions and movements under different lighting conditions. Overall, the data preprocessing module is instrumental in enhancing the quality and suitability of the input data for accurate and reliable drowsiness detection by the system.

5.2.2 FEATURE EXTRACTION MODULE

The feature extraction module in the driver drowsiness detection system is responsible for identifying and extracting relevant and discriminative features from the preprocessed data, such as facial images or video frames. This module aims to capture essential characteristics and patterns that can effectively differentiate between alert and drowsy states of the driver. Firstly, it employs facial landmark detection algorithms to locate key points on the face, including the positions of the eyes, eyebrows, nose, and mouth. These landmarks serve as crucial reference points for subsequent feature extraction. The module then extracts various facial features, including eye aspect ratio (EAR), mouth aspect ratio (MAR), head pose, and eye closure duration, which are indicative of drowsiness-related behavior.The selected features become the building blocks for machine learning algorithms, allowing the system to recognize and respond to drowsy driving behavior effectively. The choice of relevant features is pivotal to the system's accuracy and efficiency, and it plays a critical role in promoting road safety by preventing accidents caused by driver fatigue.

Fig5.2.1: Ear Aspect Ratio

5.2.3 DROWSINESS DETECTION MODULE

The drowsiness detection module in the provided Python script is designed to monitor the driver's facial landmarks and eye characteristics in real-time, with the aim of identifying signs of drowsiness. By employing the eye_aspect_ratio function, the module calculates the eye aspect ratio (EAR) based on the Euclidean distances between specific landmarks, enabling the assessment of drowsiness levels. The script continuously evaluates the computed EAR against a predefined threshold and triggers an alert when the EAR remains below the threshold for a specified number of consecutive frames. To ensure timely intervention, an alert mechanism is activated through the sound_alarm function, playing an alarm sound to prompt the driver to regain alertness. Throughout the process, the script updates the video frame to display the current EAR value, providing immediate visual feedback regarding the detected drowsiness level. This module serves as a critical safety feature, effectively monitoring the driver's eye movements and promptly issuing alerts to mitigate potential accidents caused by driver drowsiness.

CHAPTER 6
SYSTEM SPECIFICATION

6.1 SOFTWARE REQUIREMENTS

Operating System	: Windows 10
Front End	: OpenCV
Language	: Python

6.2 HARDWARE REQUIREMENTS

Processor	:	Intel Core i3
Hard Disk	:	512 GB
RAM	:	8 GB
Web Camera	:	1080P

CHAPTER 7
APPENDICES

7.1 SAMPLE PROGRAM

```
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 playsound
import os
def sound_alarm(path):
global alarm_status
global alarm_status2
global saying
while alarm_status:
print('call')
playsound.playsound(path)
if alarm_status2:
print('call')


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):



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")
ap.add_argument("-a", "--alarm", type=str, default="D:\Mini_Project\Real-
Time-Drowsiness-Detection-System-main\Alert.wav", help="path alarm .WAV
file")
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
if args["alarm"] != "":
t = Thread(target=sound_alarm,
args=(args["alarm"],))



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
if args["alarm"] != "":
t = Thread(target=sound_alarm,
args=(args["alarm"],))
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()
cv2.imshow("Frame", frame)
key = cv2.waitKey(1) & 0xFF
```

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

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

CHAPTER 8

EXPERIMENTAL RESULT

8.1 RESULT

Implementation of drowsiness detection with Python and OpenCV was done which includes the following steps: Successful runtime capturing of video with camera. Captured video was divided into frames and each frame were analysed. Successful detection of face followed by detection of eye. If closure of eye for successive frames were detected, then it is classified as drowsy condition else it is regarded as normal blink and the loop of capturing image and analysing the state of driver is carried out again and again. In this implementation during the drowsy state the eye is not surrounded by circle or it is not detected, and corresponding message is shown.

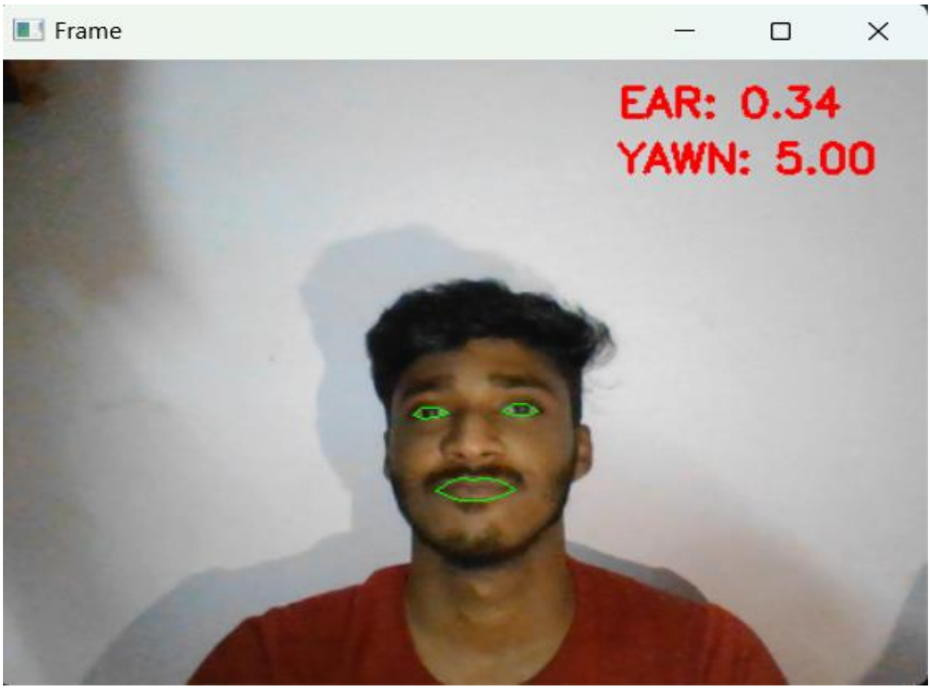

Fig 7.2.1: Driver is awake

Fig 7.2.1 It is a initial state of the driver it, Demonstrates the detection of eyes and mouth under normal conditions eye aspect ratio, in this the eye aspect ratio is above the threshold value.

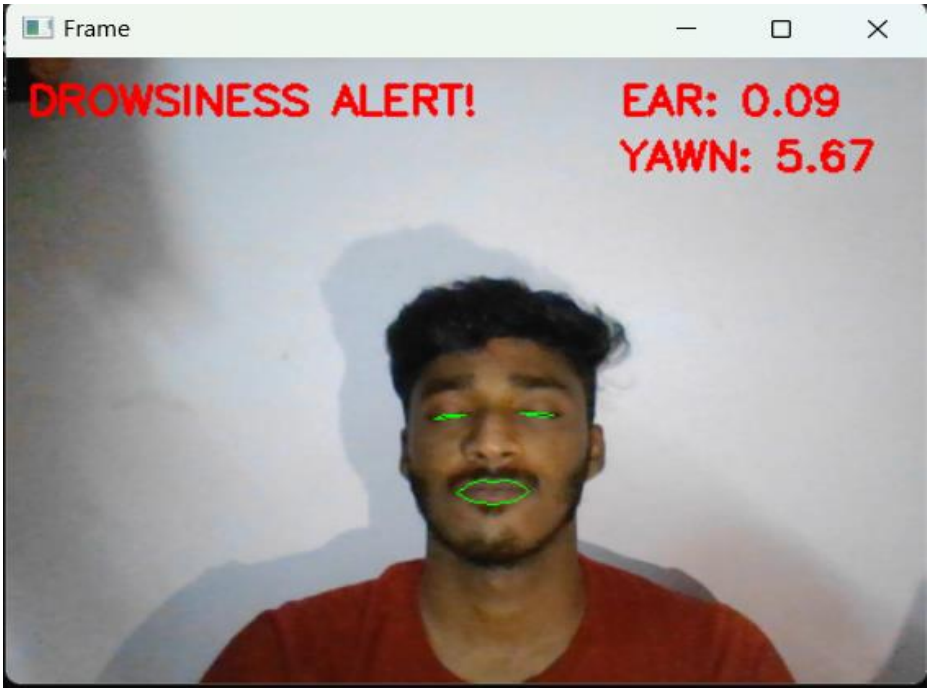

Fig 7.2.2: Detecting the driver is drowsy

Fig 7.2.2 Demonstrates the detection of eyes under closed conditions eye aspect ratio, here the eye aspect ratio fall below the threshold value and the alert alarm will be ringed alert the driver to regain his focus on driving.

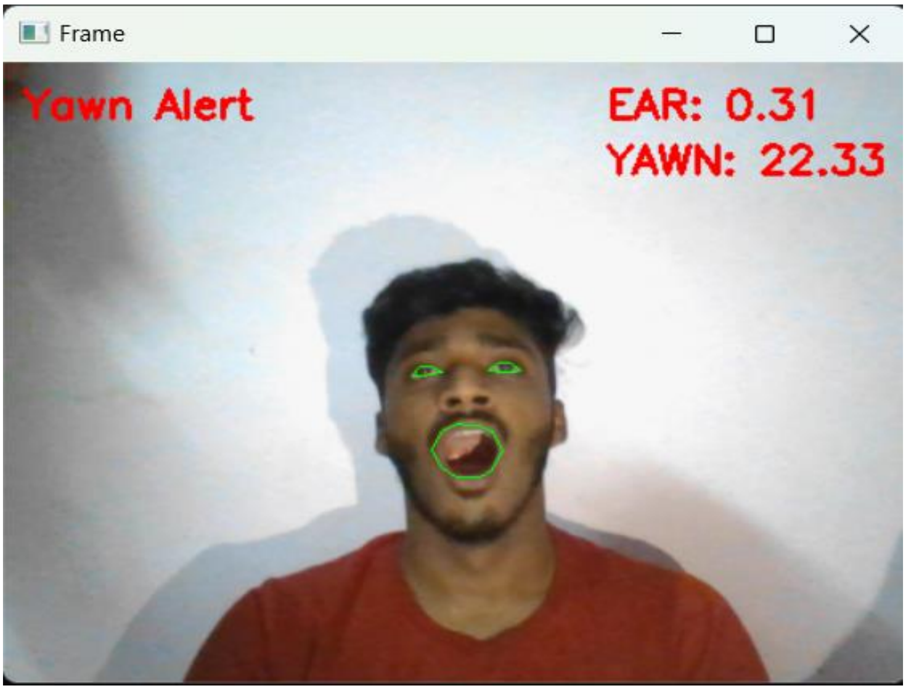

Fig 7.2.3: Detecting the Driver is yawning

Fig 7.2.3 Demonstrates the detection of mouth under open conditions mouth aspect ratio falls above the threshold value so the yawn alert is given and an alert alarm will be ringed to alert the driver to regain his focus on driving.

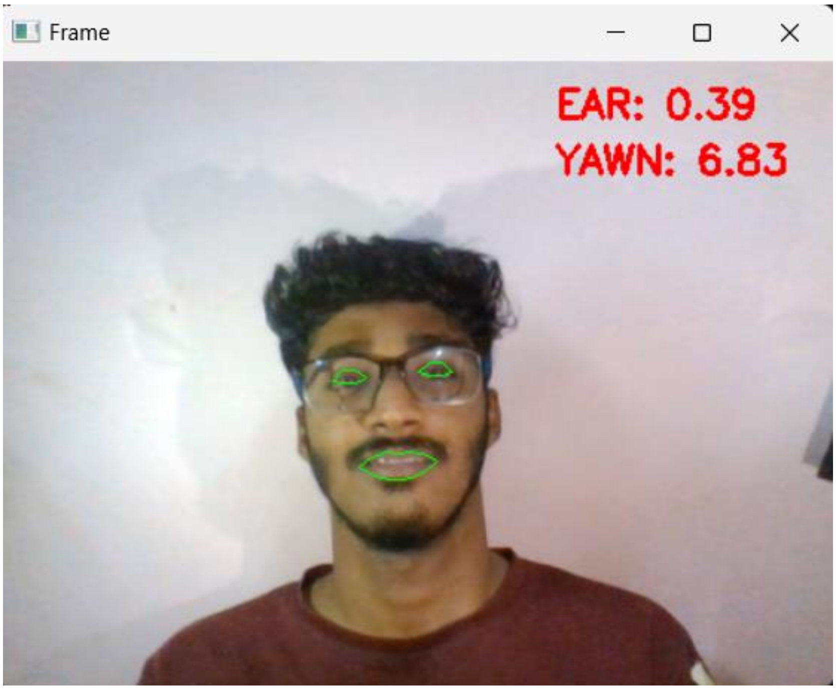

Fig 7.2.4: Detecting Eyes while wearing glasses

Fig 7.2.4 Demonstrates the detection of eyes by wearing eye glasses mouth under normal conditions eye aspect ratio, in this the eye aspect ratio is above the threshold value.

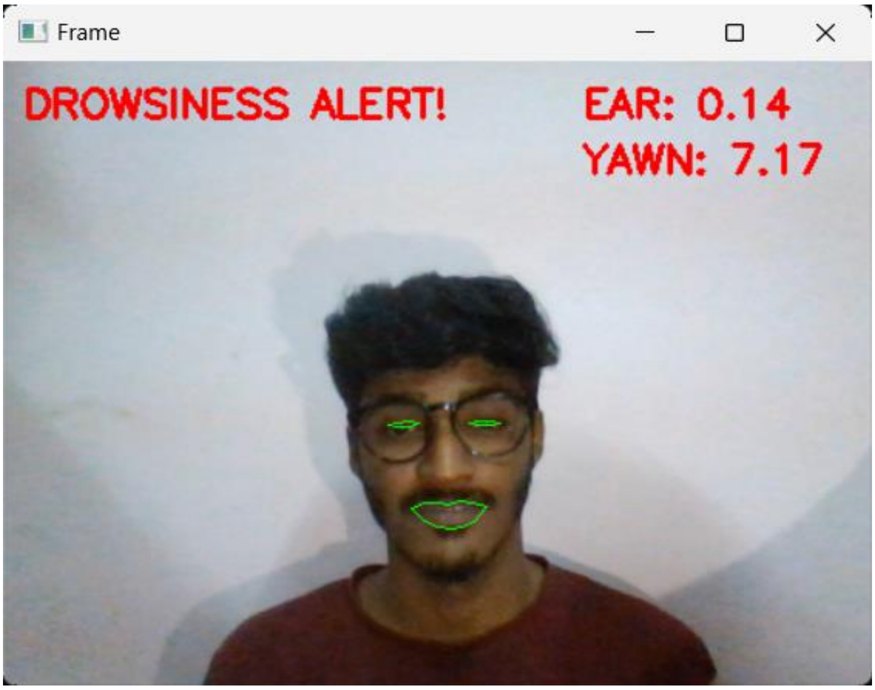

Fig 7.2.5: Detecting drowsiness while wearing glasses

Fig 7.2.5 Demonstrates the detection of eyes by wearing eye glasses mouth under closed conditions eye aspect ratio, in this the eye aspect ratio is below the threshold value and the alert alarm will be ringed alert the driver to regain his focus on driving

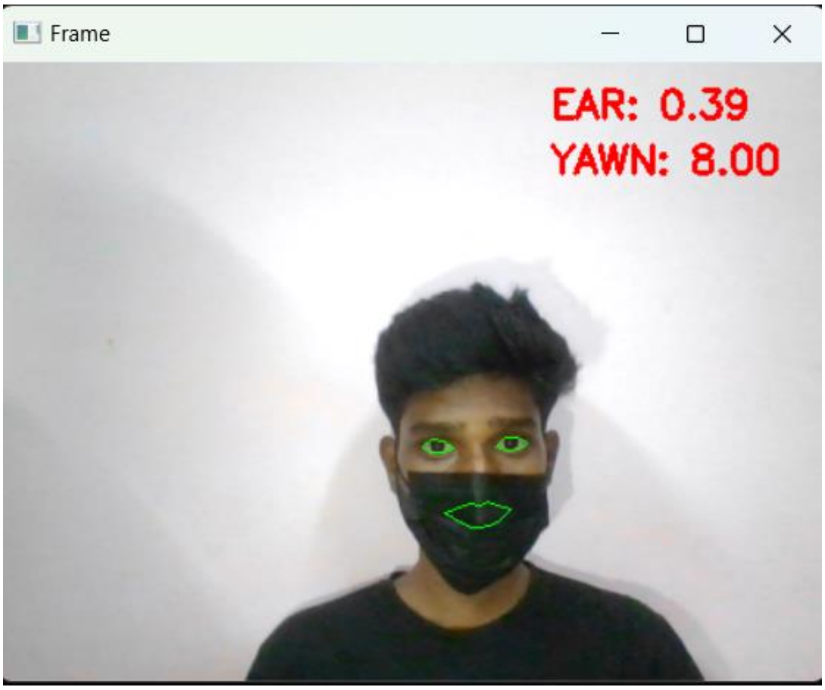

Fig 7.2.6: Detecting Eyes while wearing mask

Fig 7.2.6 Demonstrates the detection of eyes by wearing face mask and mouth under normal conditions eye aspect ratio, in this the eye aspect ratio is above the threshold value

Fig 7.2.7: Detecting drowsiness while wearing mask

Fig 7.2.7 Demonstrates the detection of eyes by wearing face mask and mouth under closed conditions eye aspect ratio, in this the eye aspect ratio is below the threshold value and the alert alarm will be ringed alert the driver to regain his focus on driving

CHAPTER 8

CONCLUSION

We have measured the driver's safety parameters. Firstly in drowsiness detection model we made an alert system which can alert the driver whenever he feels drowsy for more than 3-4 seconds he'll be alarmed and can stay awake or take a break. The drowsiness detection system can be implemented in every vehicle such that we can prevent road accidents and decrease the death ratio which are caused due to drowsiness and the face recognition system is very helpful to maintain the security of the vehicle preventing vehicle thefts. AI techniques are growing vastly, we can make systems more intelligent to understand as the requirements of the hour. We can introduce various models and use different types of algorithms to get the best results. Road accidents are common in countries like India. Due to small negligence there's a huge loss to the lives of the human. By adapting such systems, we can try to control the road accidents and also the security of the vehicle can be maintain by taking the alert and security systems into consideration.

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