INTELLIGENCE EXPEDITIOUS ACCIDENT DETECTION

A MINI PROJECT REPORT

Submitted by

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BONAFIDE CERTIFICATE

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ABSTRACT

Detection of human error caused in driving of a four-wheeler vehicle to prevent accidents expeditiously. The idea behind the human error in driving is to detect the drowsiness of the driver by measuring the facial emotions over real time with the help of Computer Vision and Shape Predictor Model and alert the driver immediately. The system uses a small monochrome camera that points directly towards the driver's face and monitors the driver's eyes and mouth in order to detect fatigue. In such a case when fatigue is detected, a warning signal is issued to alert the driver. The system deals with using information obtained in the real time image to find the edges of the face, which narrows the area of where the eyes and the mouth may exist. Once the face area is found, the eyes and the mouth are found by computing the horizontal averages in the area. Taking into account the eye and the mouth regions in the face present, changes with great intensity. Once the eyes and the mouth are located, measuring and comparing the distances between the intensity changes to that of the threshold value in the eye and mouth area which determines whether the eyes and the mouth are open or closed. In this way, the system draws the conclusion that the driver is falling asleep and issues a warning signal. An alert message is sent automatically by the system to the concerned ones if the driver persists in the non-stop dozing or yawning state in order to escape the mishap. The highest advantage of this system is to reduce the chance of human error by detecting it swiftly.

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LIST OF ABBREVIATIONS

AI	Artificial Intelligence
ML	Machine Learning
OPENCV	Open-Source Computer Vision

CHAPTER 1

INTRODUCTION

Driver drowsiness and fatigue are one of the most common reasons for accidents. The number of fatalities due to such accidents is increasing worldwide each year. This paper aims to lessen the number of accidents due to driver drowsiness and fatigue. This will in turn increase transportation safety. Driver drowsiness detection is a technology in vehicles that is useful in preventing accidents and saving the lives of drivers when they are getting drowsy.

This project uses computer vision for the detection of driver's drowsiness. With the constant improvement and novelty in technology, there is an advancement in transportation modes. Our dependencies on it have started increasing at a high rate. It has greatly affected our lives in many ways. Considering any social status, there are some rules which should be followed by any vehicle driver. One is to stay alert and the other one is being active while driving. The existing technologies to detect driver drowsiness are either very costly systems that apply to the high-end car models or systems that are affordable but are not robust.

1.1 PROBLEM DEFINITION

- Driver drowsiness is simply a project that alerts the driver when the driver sleeps.
- Open CV plays a major role in this project in detecting the facial features.
- AI-powered application is used for capturing the video of the driver while comparing them with the threshold value of eyes and mouth.
- Clearly Intelligent Expeditious Accident Detection, detects and notifies the driver when the system finds the driver feels drowsy.
- It also provides an alert message to the concerned person's mobile phone such that utmost be already registered via scanning the QRcode in the detection system.

1.2 OBJECTIVE OF THE PROJECT

- The main objective is to develop a system that is accurate to detect a driver's drowsiness based on eyelid movement and yawning and is reliable to give appropriate voice alerts in real-time.
- The other objectives include designing a system that detects drowsiness of drivers by monitoring the eyes of the driver regularly, especially the retina.
- The system should give an alert to the driver when the driver yawns frequently or when the driver's eyes remain closed for a few seconds.

1.3 SIGNIFICANCE OF THE PROJECT

Drowsiness and fatigue lead the cause of road accident in India. Thus, Driver Drowsiness Detection by Using Webcam is being introduced to minimize and reduce the number of accidents involving 4 wheelers like cars, trucks and lorries. It detects the drowsiness signs and alerts drivers when they are in drowsy state.

1.4 OUTLINE OF THE PROJECT

Intelligent Expeditious Accident Detection system prevents the accidents caused due to carelessness of driver. The System will undergo the prevention process by following the below process:

- It detects the driver face by capturing the video in real time.
- It detects the eye portion of the driver while comparing the threshold value.
- It detects the mouth portion of the driver to that of the threshold value.
- It produces the alert message to the concerned person.

CHAPTER 2

LITERATURE REVIEW

The purpose of Accident prevention system is to reduce the rate of loss of human life caused by accidents. The system architecture integrates the face prediction model and OpenCV to detect face and to compare the eyes and mouth threshold value. The system here uses python to alert the driver by producing alarm sound.

Driver drowsiness and fatigue are one of the most common reasons for accidents. The number of fatalities due to such accidents is increasing worldwide each year. This paper aims to lessen the number of accidents due to driver drowsiness and fatigue. This will in turn increase transportation safety. Driver drowsiness detection is a technology in vehicles that is useful in preventing accidents and saving the lives of drivers when they are getting drowsy. This project uses computer vision for the detection of driver's drowsiness. With the constant improvement and novelty in technology, there is an advancement in transportation modes. Our dependencies on it have started increasing at a high rate. It has greatly affected our lives in many ways. Considering any social status, there are some rules which should be followed by any vehicle driver. One is to stay alert and the other one is being active while driving. The existing technologies to detect driver drowsiness are either very costly systems that apply to the high-end car models or systems that are affordable but are not robust.

Intelligent Expeditious Accident Detection system does the following actions:

- It detects the driver face by capturing the video in real time.
- It detects the eye portion of the driver while comparing the threshold value.
- It detects the mouth portion of the driver to that of the threshold value.
- It produces the alert message to the concerned person.

CHAPTER 3

SYSTEM ANALYSIS

System analysis is a problem-solving technique that decay a system into component pieces of purpose of studying how well those component parts work and interact to accomplish their purpose. The following chapter provides a detailed description of the existing system. It also provides an overview of the proposed system and feasibility of intelligence accident detection.

3.1 EXISTING SYSTEM

3.1.1 Accident Prevention System

- In India as the population grows the number of vehicle usage are also increasing drastically.
- As a result, accidents are also getting increased.
- So, the aim of the model is to find the signs of exhaustion in drivers in order to avoida misadventure.
- The existing system includes in finding the drowsiness of the driver in real timeusing computer vision and notify the driver of the current state.
- But there are some pitfalls in the existing system such as, if the driver continues tobe in the dozy state, then there are a lot of chances for a great disaster.

3.2 DRAWBACK

3.2.1 Accident Detection

- If the driver continues to be in the dozy state even after the continuous ringing ofalarm, then there are chances for a great disaster to take place.
- If the driver wears glasses, it becomes hard to detect the closure of eyes and hencethis requires to be revised again.

3.3 PROPOSED SYSTEM

A proposed system of "Intelligence Expeditious Accident Detection" system the functionality of driver drowsiness detection, yawn detection, alert system and voicemail to the concerned person.

3.3.1 Intelligence Accident detection

- Since a drowsy person can yawn at times, the same can be done for detecting 'yawning' too. If the person yawns while driving, it would prompt another alert alarm for this to make him/her cautious.
- After the detection, the model identifies if the driver is dozy or not by comparing with a threshold value to that of the real time. Then the system will alert the driverand also sends an alert message to the concerned ones.

3.3.2 Architecture Diagram

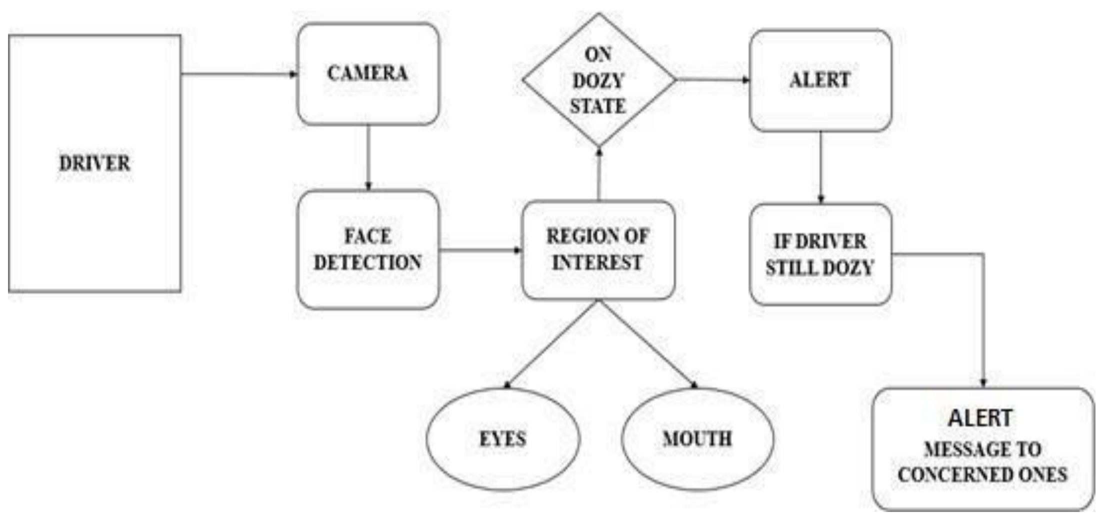


Fig 3.1 Architecture diagram

3.4 FEASIBILITY STUDY

An analysis and evaluation of a proposed project to determine if it is technically feasible, is feasible within the estimated cost, and will be profitable. Feasibility studies are almost always conducted where large sums are at stake. A feasibility study aims to objectively and rationally uncover the strengths and weaknesses of an existing accident prevention system and threats present in the environment, the resources required to carry through, and ultimately the prospects for success in the intelligent accident detection system.

3.4.1 Tests of Feasibility

Feasibility study is conducted once the problem is clearly understood. Feasibility study is necessary to determine that the proposed system in intelligent accident detection is feasible by considering the technical, operational, and economical factors. By having a detailed feasibility study the management in the will have a clear-cut view of the proposed system of the drowsiness detection. Feasibility study encompasses the following things:

- Technical Feasibility
- Economical Feasibility
- Operational feasibility

3.4.1.1 Technical Feasibility

A large part of determining resources has to do with assessing technical feasibility. It considers the technical requirements of the proposed project of accident detection. The technical requirements are then compared to the technical capability of the intelligent expeditious accident detection. The systems project is considered technically feasible if the internal technical capability is sufficient to support the driver drowsiness detection requirements. The analyst must find out whether current technical resources can be upgraded or added to in a manner that fulfils the request under consideration.

The essential questions that help in testing the operational feasibility of a system include the following:

- Is the project feasible within the limits of current technology?

- Does technology exist at all?
- Is it available within given resource constraints?
- Manpower- programmers, testers & debuggers
- Software and hardware
- Are the current technical resources sufficient for the new system?

3.4.1.2 Operational Feasibility

Operational feasibility is dependent on human resources available for the project and involves projecting whether the system will be used if it is developed and implemented. Operational feasibility is a measure of how well a proposed system in intelligent accident detection solves the problems, and takes advantage of the opportunities identified during scope definition and how it satisfies the requirements identified in the requirements analysis phase of driver drowsiness detectiondevelopment.

The essential questions that help in testing the operational feasibility of a system include the following:

- Does current mode of operation provide adequate throughput and response time?
- Does current mode provide end users with timely, pertinent, accurate and useful formatted information?
- Does current mode of operation provide cost-effective information services to the business?
- Could there be a reduction in cost and or an increase in benefits?

3.4.1.3 Economical Feasibility

Economic analysis could also be referred to as cost/benefit analysis. It is the most frequently used method for evaluating the effectiveness of a new system of the accident detection. In economic analysis the procedure is to determine the benefits and savings that are expected from a candidate system and compare them with costs.

If benefits outweigh costs, then the decision is made to design and implement the accident detection system. An entrepreneur must accurately weigh the cost versus benefits before taking an action.

Possible questions raised in economic analysis are:

- Is the system cost effective?
- Do benefits outweigh costs and system study

CHAPTER 4

SYSTEM SPECIFICATION

4.1 FUNCTIONAL REQUIREMENTS

4.1.1 Capturing Real Time Video

The first is the preprocessing block where the face detection is performed on the real-time video captured by the camera. Once a face is found, eyes and mouth is detected and then processed in the second block to detect driver drowsiness. The eyes of the driver are continuously monitored and if found closed for a certain period of time, then system will give the alert to the person who is driving a four -wheeler with the alarm sound.

4.1.2 Phone Connectivity Using QRCODE

We have integrated the scan code with the notifications. The current notification will be popped up on close family members who have the access to the QRCODE of the system on their smart phone which will also prompt emergency alert to him and in parallel, it will notify among others the same. This will lead to the continuous raising up of the notifications on the closed one's cell phone and thus through the appearance of scanning labelled QR code on their smartphones willpropagate to identify and check the present status of the driver.

This will help to improve the situation in case the driver has to dwell into the condition of fatigue and drowsiness by giving a spontaneous text alert at the response. The results which are obtained are detected to prevent the major hazards on the road indifferent conditions and different intensities.

4.2 NON-FUNCTIONAL REQUIREMENTS

4.2.1 Scalability

The system shall be able to scale based on the real time video.

4.2.2 Third party interactions

The system should be able to interact with the mobile for sending a text alert to the concerned person using internet connectivity.

4.2.3 Portability

The system should run on a variety of operating systems that support the python language. The system should run on a variety of hardware**.**

4.2.4 Maintainability

- The system should be easy to maintain.
- There should be a clear separation between the data access in mobile and the system.

4.2.5 Ethics

The system shall not store or process any information about its user's real time video.

4.3 HARDWARE REQUIREMENTS

Processor	:	Dual core processor
RAM	:	8 GB
Hard Disk	:	250 GB
Monitor	:	16'' Color Monitor
Pointing Device	:	Mouse
Smart Phone	:	Any Type

4.4 SOFTWARE REQUIREMENTS

Programming Language	:	Python
Operating System	:	Windows
Application	:	Visual Studio

CHAPTER 5

SOFTWARE DESCRIPTION

A software requirements specification (SRS) is a description of a software system to be developed. It lays out functional and non-functional requirements, and may include a set of use case that describe user interactions that the software must provide. Software requirements specification establishes the basis for an agreement between users and chat bot on what the software product is to do as well as what it is not expected to do. Software requirements specification permits a rigorous assessment of requirements before design can begin and reduces later redesign. It should also provide a realistic basis for estimating product costs, risks, and schedules.

5.1 ARTIFICIAL INTELLIGENCE

Artificial intelligence (AI) is the ability of a computer or a robot controlled by a computer to do tasks that are usually done by humans because they require human intelligence and discernment. Although there are no AIs that can perform the wide variety of tasks an ordinary human can do, some AIs can match humans in specific tasks

5.1.1 FEATURES

- Eliminate dull and boring tasks
- Data ingestion
- Imitates human cognition
- Futuristic
- Prevent natural disasters
- Facial Recognition and Chatbots

5.1.2 ADVANTAGES

- AI drives down the time taken to perform a task. It enables multi-tasking and eases the workload for existing resource.
- AI enables execution of hitherto complex tasks without significant cost outlays.
- AI operates 24x7 without interruption or breaks and has no downtime
- AI augments the capabilities of differently abled individuals
- AI has mass market potential; it can be deployed across industries.
- AI facilitates decision-making by making the process faster and smarter.

5.2 MACHINE LEARNING

Machine learning is a modern innovation that has enhanced many industrial and professional processes as well as our daily lives. It's a subset of artificial intelligence (AI), which focuses on using statistical techniques to build intelligent computer systems to learn from available databases.

5.2.1 Features

- Preprocessing of Data
- Diverse Algorithms
- Training and Tuning

5.2.2 Advantages

- Easily identifies trends and patterns
- No human interaction needed (Automation)
- Continuous improvement
- Handling multi-dimensional and multi-variety data
- Wide range of applications

5.3 COMPUTER VISION

Computer vision is a field of artificial intelligence (AI) that enables computers and systems to derive meaningful information from digital images, videos and other visual inputs and take actions or make recommendations based on that information.

5.3.1 Advantages

The use of Computer Imagining grows rapidly thanks to the discovery of advantages for industries. There are five main advantages of computer vision:

- Process in a simpler and faster way: it allows the clients and industries to check. Also, it gives them access to their products. It’s possible thanks to the existence ofComputer Vision in fast computers.
- Reliability: computers and cameras don’t have the human factor of tiredness, which is eliminated in them. The efficiency is usually the same, it doesn’t depend on external factors such as illness or sentimental status.
- Accuracy: the precision of Computer Imagining, and Computer Vision will ensure abetter accuracy on the final product.
- A wide range of use: We can see the same computer system in several different fields and activities. Also, in factories with warehouse tracking and shipping of supplies, and in the medical industry through scanned images, among other multiple options.
- The reduction of costs: time and error rate are reduced in the process of Computer Imagining. It reduces the cost of hire and train special staff to do the activities thatcomputers will do as hundreds of workers.

CHAPTER 6

PROJECT DESCRIPTION

Driver’s inattention might be the result of a lack of alertness when driving due to driver drowsiness and distraction. Driver distraction occurs when an object or event draws a person’s attention away from the driving task. Unlike driver distraction, driver drowsiness involves no triggering event but, instead, is characterized by a progressive withdrawal of attention from the road and traffic demands. Both driver drowsiness and distraction, however, might have the same effects, that is decreased driving performance, longer reaction time, and an increased risk of crash involvement.

6.1 OVERVIEW OF THE PROJECT

The driver's face is identified using a lens that is installed on the front mirror. In the first step, the device will identify and monitor the face using a collection of frame shots captured by the camera. Then the location of eyes and mouth are detected in the real time. The closed eye gesture is detected along with yawning detection. The mouth and eye geometrical features are then used to locate the yawn. The driver assistant will alert the driver using an Alarm. This is to be achieved in Different phases given below:

- Detection of face
- Detection of eyes
- Closed Eye detection
- Yawn detection
- Alarm
- Text Alert to concerned person

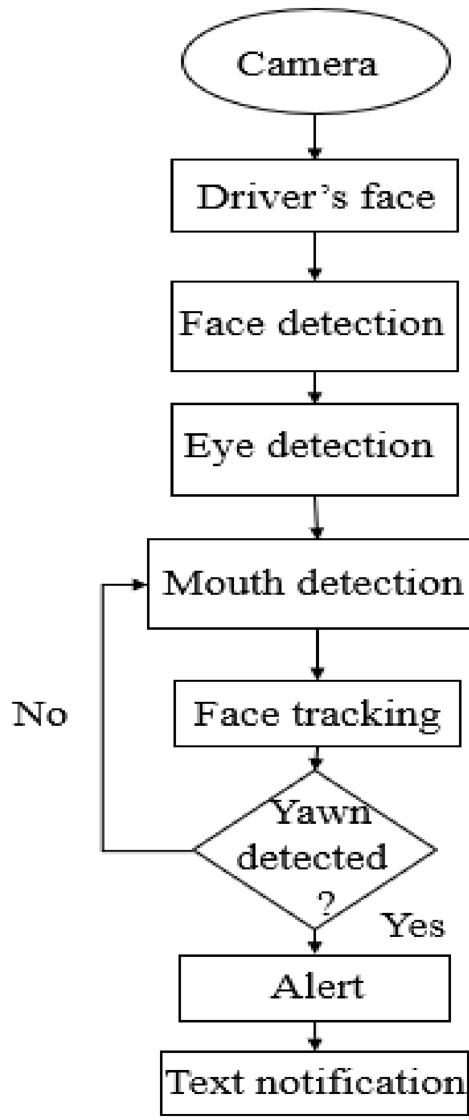


Fig 6.1 Overview diagram

6.2 MODULE DESCRIPTION

6.2.1 Face and Eyes Detection

Firstly, the human face is detected using OpenCV and then the various poses are being captured. The pose takes the form of 68 landmarks. These are the points on the face such as the corners along the eyebrows. If their eyes have been closed for a certain amount of time, we will assume that the driver is starting to doze off.

6.2.2 Yawn Detection

The next step towards yawning detection is to find the location of mouth and the lips. To do so, mouth area will be segmented in the face. The strong difference between lips color and face color is used in our method. The geometrical features of the face and relative location of the mouth with respect to eyes can be exploited in this step to verify the validity of the detected mouth is yawning or not.

6.2.3 Alert Notification

The model detects if the driver is dozy or not by comparing with a threshold value to that of the real time. Then the system will alert the driver of the drowsiness.

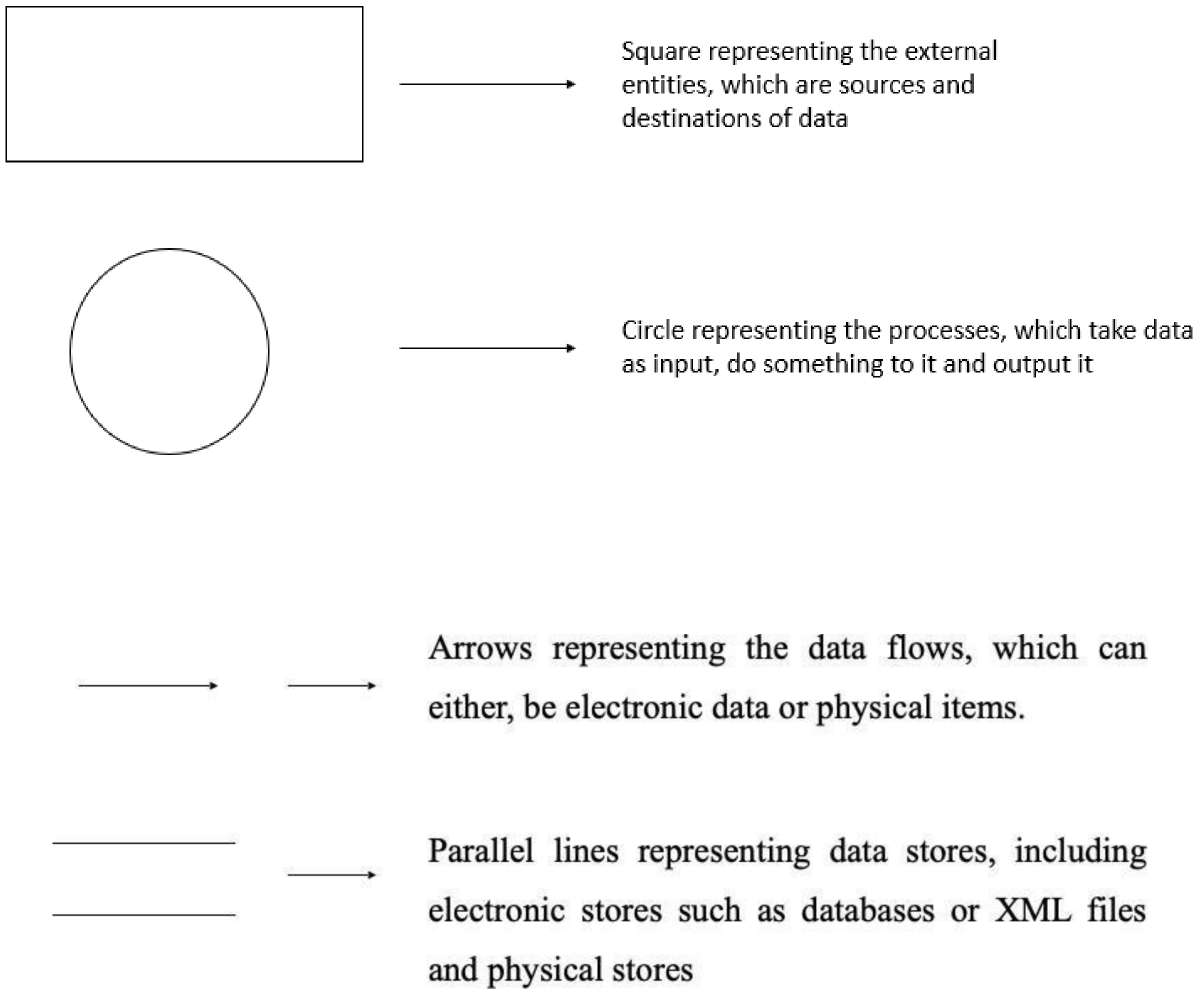
6.2.4 Generate Text Alert

The drivers non-stop dozing state we will further make a text message containing the current situation of the driver to their relatives or friends.so that they will be alerted with the current situation of driver in order to escape the mishap.

6.3 DATA FLOW DIAGRAM

Data flow diagram is used to describe how the information is processed and stored and identifies how the information flows through the processes. Data flow diagram illustrates how the data is processed by a system in terms of inputs and outputs. The data flow diagram also depicts the flow of the process and it has various levels. The initial level is context level which describes the entire system functionality and the next level describes each and every sub module in the main system as a separate process or describes all the process involved in the system separately.

Data flow diagram are made up of number of symbols,



6.3.1 DFD Level 0

The driver uses the Accident Detection System. The drowsiness of the driver is predicted by the system and the output is reported in the form of warning alarm followed by a Phone notification to the concerned ones.

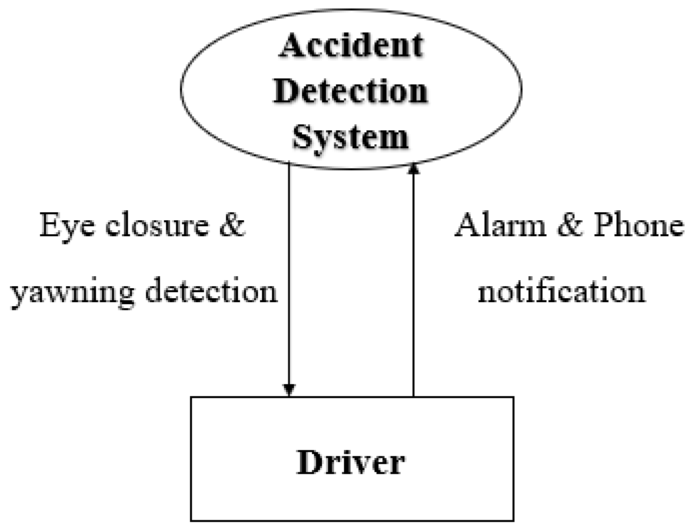


Fig.6.3.1 DFD Level 0

6.3.2 DFD Level 1

In the DFD level 1, the driver's face is detected by the camera. Then using the Predictor model, the dozing of the driver is identified and then a warning alarm followed by a phone notification is made known to the concerned ones.

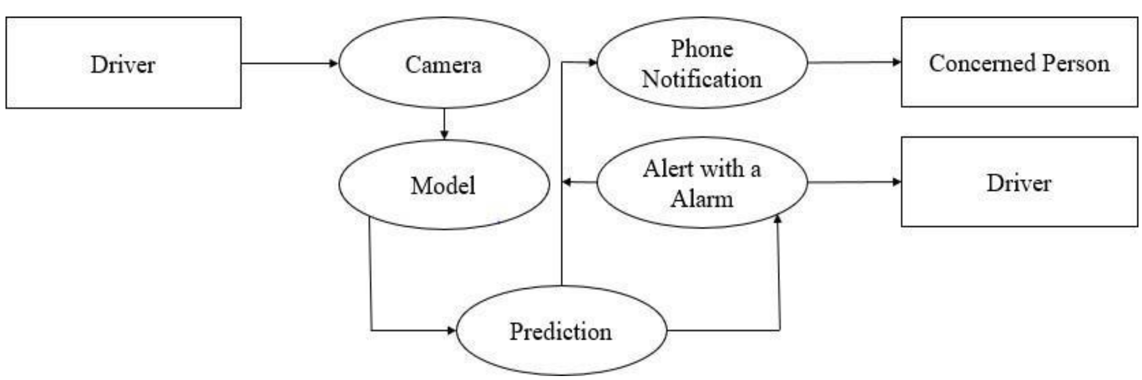


Fig.6.3.2 DFD Level 1

6.4 INPUT DESIGN

The input design is the link between the information system and the user. It comprises the developing specification and procedures for data preparation and those steps are necessary to put transaction data in to a usable form for processing can be achieved by inspecting the computer to read data from a written or printed document or it can occur by having people keying the data directly into the system. The design of input focuses on controlling the amount of input required, controlling the errors, avoiding delay, avoiding extra steps and keeping the process simple. The input is designed in such a way so that it provides security and ease of use with retaining the privacy. Input Design considered the following things:

- What data should be given as input?
- How the data should be arranged or coded?
- The dialog to guide the operating personnel in providing input.
- Methods for preparing input validations and steps to follow when error occur.

Input Design is the process of converting a user-oriented description of the input intoa computer-based system. This design is important to avoid errors in the data input process and show the correct direction to the management for getting correct information from the computerized system.

It is achieved by creating user-friendly screens for the data entry to handle large volume of data. The goal of designing input is to make data entry easier and to be free from errors. The data entry screen is designed in such a way that all the data manipulates can be performed. It also provides record viewing facilities.

When the data is entered it will check for its validity. Data can be entered with the help of screens. Appropriate messages are provided as when needed so that the user will not be in maize of instant. Thus, the objective of input design is to create an input layout that is easy to follow.

6.5 OUTPUT DESIGN

A quality output is one, which meets the requirements of the end user and presents the information clearly. In any system results of processing are communicated to the users and to other system through outputs. In output design it is determined how the information is to be displaced for immediate need and also the hard copy output. It is the most important and direct source information to the user. Efficient and intelligent output design improves the system’s relationship to help user decision-making.

CHAPTER 7

SYSTEM TESTING

System Testing is a level of the software testing where complete and integrated software is tested. The purpose of this test is to evaluate the system's compliance with the specified requirements. By definition of ISTQB system testing is the process of testing an integrated system to verify that it meets specified.

7.1 TESTING METHODS

Software Testing Type is a classification of different testing activities into categories, each having, a defined test objective, test strategy, and test deliverables. The goal of having a testing type is to validate the Application under Test for the defined Test Objective. For instance, the goal of Accessibility testing is to validate the AUT to be accessible by disabled people. So, if your Software solution must be disabled friendly, you check it against Accessibility Test Cases.

7.2 TYPES OF TESTING

7.2.1 Unit Testing

In computer programming, unit testing is a software testing method by which individual units of source code, sets of one or more computer program modules togetherwith associated control data, usage procedures, and operating procedures, are tested to determine whether they are fit for use.In this accident detection system, every unit of code is been tested and the correctness of every module is been ensured.

7.2.2 Integration Testing

Integration testing (sometimes called integration and testing, abbreviated I&T) is the phase in software testing in which individual software modules are combined and tested as a group. It occurs after unit testing and before validation testing. Integration testing takes as its input modules that have been unit tested, groups them in larger aggregates, applies tests defined in an integration test plan to those aggregates, and delivers as its output the integrated system ready for system testing.

In this detection system, the units are been tested as a whole and the testing was successful.

7.2.3 Functional Testing

Functional testing is a quality assurance (QA) process and a type of black-box testing that bases its test cases on the specifications of the software component under test. Functions are tested by feeding them input and examining the output, and internal program structure is rarely considered (unlike white-box testing). Functional testing usually describes what the system does. Functional testing does not imply that you are testing a function (method) of your module or class. Functional testing tests a slice of functionality of the whole system.

Functional testing has many types:

- Smoke testing
- Sanity testing
- Regression testing
- Usability testing

7.2.4 Stress Testing

Stress testing a Non-Functional testing technique that is performed as part of performance testing. During stress testing, the system is monitored after subjecting thesystem to overload to ensure that the system can sustain the stress.

Reasons can include:

- to determine breaking points or safe usage limits’
- to confirm mathematical model is accurate enough in predicting breaking points
- to confirm intended specifications are being met

- to determine modes of failure (how exactly a system fails)
- to test stable operation of a part or system outside standard usage

The recovery of the system from such phase (after stress) is very critical as it is highlylikely to happen in production environment.

In this accident detection system, whole of the modules are been tested and it has the safe usage measures.

7.2.5 Acceptance Testing

Acceptance Testing is a level of the software testing where a system is testedfor acceptability.

7.2.6 White Box Testing

White Box Testing is the testing of a software solution's internal coding and infrastructure. It focuses primarily on strengthening security, the flow of inputs and outputs through the application, and improving design and usability. White box testingis also known as Clear Box testing, Open Box testing, Structural testing, Transparent Box testing, Code-Based testing, and Glass Box are testing. It is one of two parts of the "box testing" approach of software testing. Its counter-part, black box testing, involves testing from an external or end-user type perspective. White box testing is based on the inner workings of an application and revolves around internal testing.

The term "white box" was used because of the see-through box concept. The clear box or white box name symbolizes the ability to see through the software's outer shell (or "box") into its inner workings. Likewise, the "black box" in "black box testing" symbolizes not being able to see the inner workings of the software so that only the end-user experience can be tested.

In this accident detection system, all the inner functionality is been tested and it is beencorrectly implemented.

7.2.7 Black Box Testing

Black box testing is a software testing technique in which functionality of the software under test (SUT) is tested without looking at the internal code structure, implementation details and knowledge of internal paths of the software. This type of testing is based entirely on the software requirements and specifications. In this accident detection system, the implementation part is been checked for its correctness.

7.2.7.1 Methods of Black Box Testing

There are many types of Black Box Testing but following are the prominent ones -

- Functional testing - This black box testing type is related to functional requirementsof a system; it is done by software testers.
- Non-functional testing - This type of black box testing is not related to testing of a specific functionality, but non-functional requirements such as performance, scalability, usability.
- Regression testing - Regression testing is done after code fixes, upgrades or any other system maintenance to check the new code has not affected the existing code.

7.3 TESTING STRATEGY

Test Strategy is also known as test approach defines how testing would be carriedout. Test approach has two techniques:

- Proactive - An approach in which the test design process is initiated as early as possible in order to find and fix the defects before the build is created.
- Reactive - An approach in which the testing is not started until after design and coding are completed.

Test strategy calls for implementing two entirely different methodologies for testing this project. In this accident detection, proactive approach is been used for testing. Sinceproactive approach is efficient it is been used in this system.

CHAPTER 8

SYSTEM IMPLEMENTATION

The system is been implemented as follows:

8.1 VIDEO CAPTURING IN REAL TIME

The video is obtained from a camera focusing on the driver's face. The processing rate of the acquired video is 5 frames per second. These frames are then flipped and converted to grayscale.

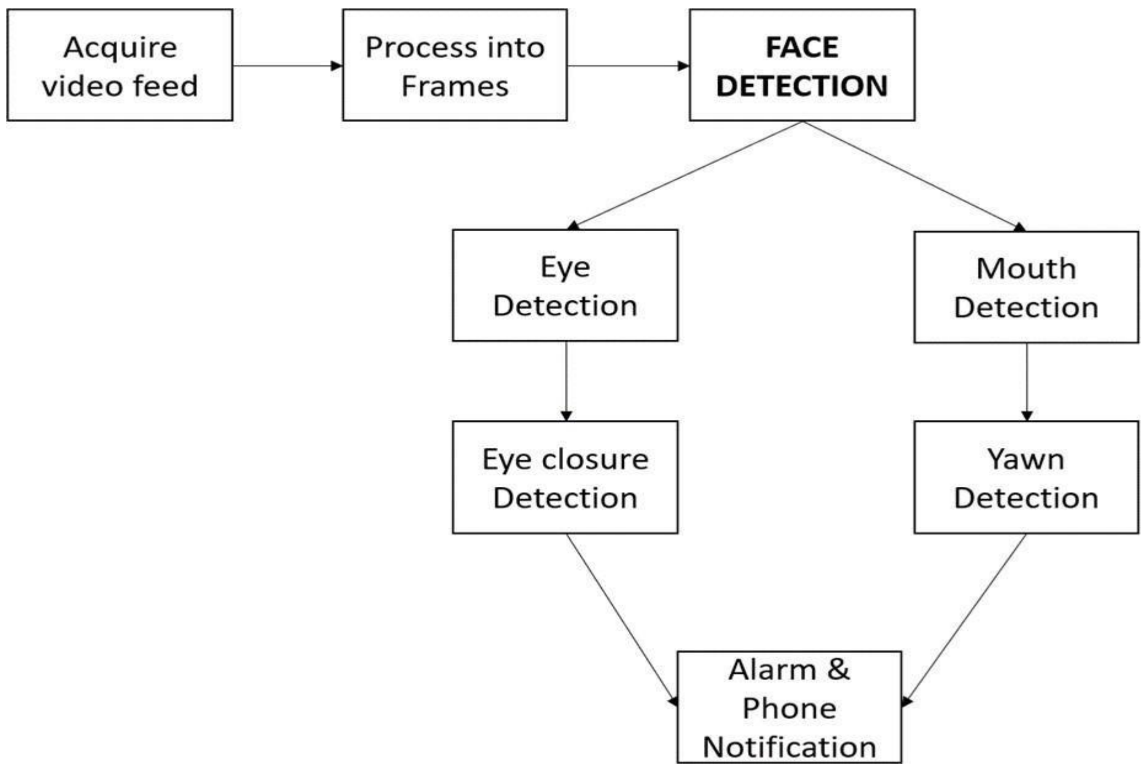


Fig 8.1 Preprocessing

8.2 FACIAL MAPPING USING DLIB

The algorithm is implemented using Dlib python library that contains a landmark's facial detector with pre trained models. It estimates and maps a person's face in the form of facial points with 68 cartesian co-ordinates as shown in Fig.2. The 68-point iBUG 300 dataset was used to train the dlib facial landmark predictor and is the source of these markings.

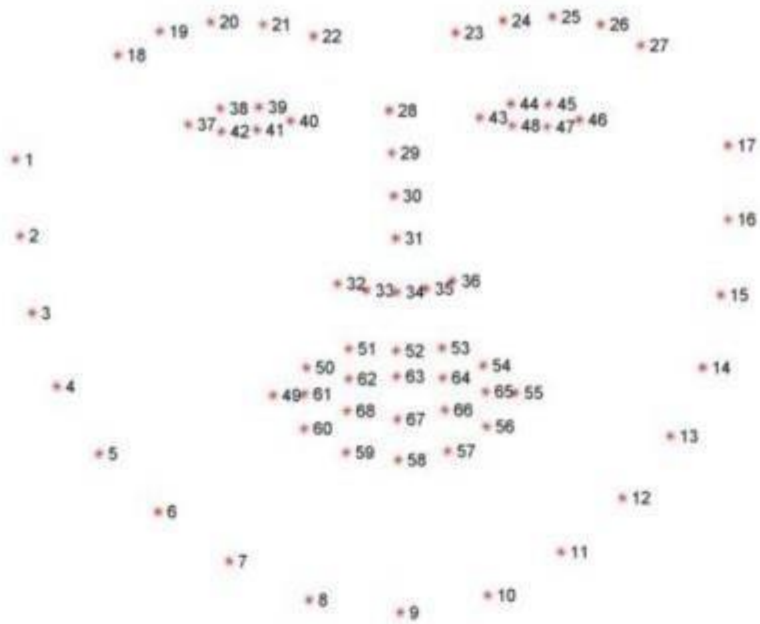


Fig 8.2 Landmarks of Face

8.3 EYE DETECTION

The eye area can be estimated from optical flow, by sparse tracking or by frame-to-frame intensity differencing and adaptive thresholding. Finally, a decision is made whether the eyes are or are not covered by eyelids.

We propose a simple but efficient algorithm to detect eye blinks by using a recent facial landmark detector. A single scalar quantity that reflects a level of the eyeopening is derived from the landmarks. Finally, having a per-frame sequence of the eye- opening estimates, the eye blinks are found by an SVM classifier that is trained on examples of blinking and non- blinking patterns.

Fig 8.3 Eye Detection

8.4 DROWSINESS DETECTION

The next step of the algorithm is to determine the person’s condition based on a pre-set condition for drowsiness. Hence if a person is drowsy his eye closure must be beyond this interval. We set a time frame of 5 seconds. If the eyes remain closed for five or more seconds, drowsiness is detected and alert pop regarding this is triggered.

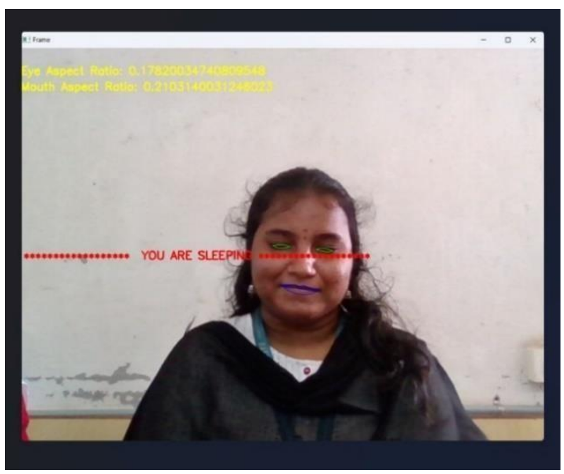


Fig 8.4 Drowsiness Detection using eye closure

8.5 YAWN DETECTION

Yawning detection is performed in two main steps:

In the first step we detect the yawn component in the face independent of the mouth location. This component is basically the hole in the mouth as the results of wide mouth opening. In the second step we will use mouth location to verify the validity of the detected component. After skin segmentation, the largest hole located inside the face is selected as the candidate for a
yawning mouth.

We will then use the information from the detected mouth to verify the detected yawning mouth. The versification criteria is the number of pixels located in the yawning mouth with respect to the number of mouth pixels as well as the relative location of the open mouth with respect to the lips.

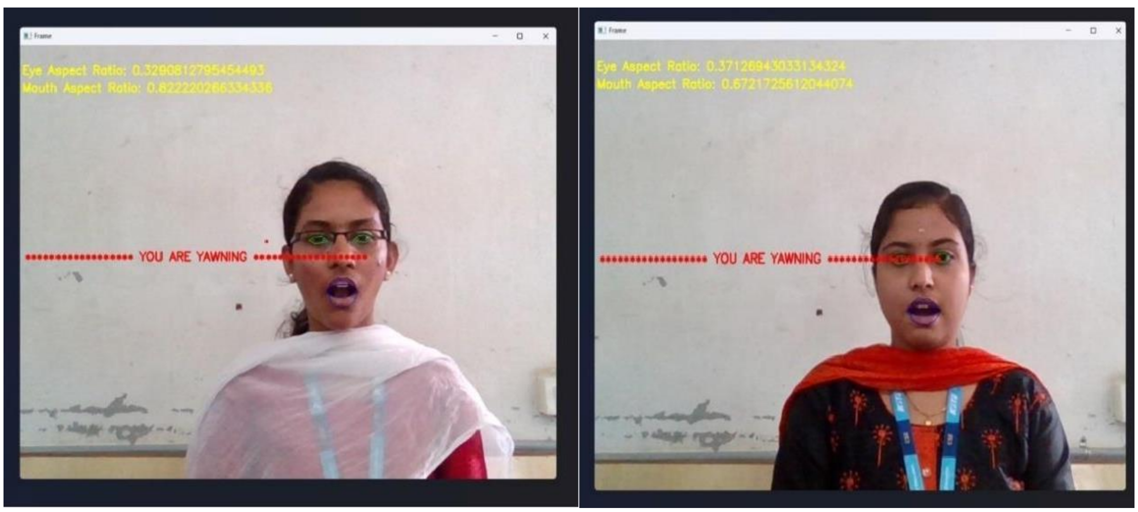


Fig 8.5 Yawn Detection

8.6 ALERT TO DRIVER

If the driver is drowsy or yawning continuously then system will give the alert to the person (driver) with the alarm sound.

8.7 TEXT ALERT TO CONCERNED PERSON

If driver doesn’t wake up for the alarm sound, system will send a short text message alerting the current situation of the driver to their relatives or friends who have the access or registered with the QRCODE of the accident detection system, so that they will be alerted with the current situation of the driver.

8.8 BULIDING THE ACCIDENT DETECTION SYSTEM

8.8.1 Detects Image

Face detection forms the main part in which the eye closure and the yawning arepredicted carefully. The triggers can be made to perform the actions such as warning the corresponding action when the prediction is present or not present. The actions willbe triggered only based on prevailing condition.

8.8.2 Actions

The model compares the real time detection value with the constant threshold value and then finds for the doziness of the person.

8.8.3 System Triggers

If the actions are found to be drowsy from the detection of the real image, then the system is triggered to make driver to be cautious using the warning alarm.

8.8.4 Phone Connectivity

Phone connecting using QRCODE allows the system to send the notification to their close ones about the current situation, then notification will be popped up on theirsmart phone which will allow prompt emergency alert. This will leads the continuous raising up of the notifications on the closed ones mobile phone.

CHAPTER 9

CONCLUSION & FUTURE ENHANCEMENTS

9.1 CONCLUSION

The model is capable of detecting drowsiness by monitoring the eyes and mouth. Shape prediction method are used to detect important features on the face. The inputs given to these methods are facial landmarks which are obtained from facial landmark detection. This module deals with the eye function which computes the ratio of distances between the horizontal and vertical eye landmarks. The is used for giving appropriate sound alerts when the driver is feeling drowsy or is yawning and also sends text alert to their concerned persons. The whole project is designed to decrease the rate of accidents and to contribute to the technology with the goal to prevent fatalities caused due to road accidents.

9.2 FUTURE ENHANCEMENT

This technology is still in the early research stage of development. Based on thework completed thus far, following modifications can be implemented:

- The aspects for future work can be credited for wireless camera in place of input video from the wired camera and the image can be processed within the control system itself which can automatically prompt the buzzer for the alarm. The more performance-boosting and efficient algorithm can be implemented for the same night camera to execute in the extreme dark lighting conditions under different subjects.
- If all these parameters are used it can improve the accuracy by a lot. We plan to further work on the project by adding a sensor to track the heart rate in order to prevent accidents caused due to sudden heart attacks to drivers.

CHAPTER 10

APPENDIX

10.1. SOURCE CODE

detection.py

```
import os
import imutils
import cv2
import dlib
import time
import multiprocessing
from imutils import face_utils
from scipy.spatial import distance
from playsound import playsound
from utilities import eye_aspect_ratio, mouth_aspect_ratio
from notify_run import Notify
from playsound import playsound

def helper():
    # Eyes and mouth threshold value
    eyeThresh = 0.25
    mouthThresh = 0.60

    # frame to check
    frame_check_eye = 5
    frame_check_mouth = 5

    # Initializing the Face Detector object
    detect = dlib.get_frontal_face_detector()
    # Loading the trained model
    predict=dlib.shape_predictor("C:/Users/TREESA/Proj1/shape_predictor_68
    _face_landmarks.dat")

    # Getting the eyes and mouth index
    (lStart, lEnd) = face_utils.FACIAL_LANDMARKS_68_IDXS["left_eye"]
    (rStart, rEnd) = face_utils.FACIAL_LANDMARKS_68_IDXS["right_eye"]
    (mStart, mEnd) = face_utils.FACIAL_LANDMARKS_68_IDXS["mouth"]

    # Initializing the Video capturing object
```

```
cap=cv2.VideoCapture(0)
# Initializing the flags for eyes and mouth
flag_eye=0
flag_mouth=0

# Calculating the Euclidean distance between facial landmark points of eyes
and mouth
while True:
        ret, frame=cap.read()
        frame = imutils.resize(frame, height = 800, width=1000)
        gray = cv2.cvtColor(frame, cv2.COLOR_BGR2GRAY)
        subjects = detect(gray, 0)
        for subject in subjects:
                shape = predict(gray, subject)
                shape = face_utils.shape_to_np(shape)
                leftEye = shape[lStart:lEnd]
                rightEye  = shape[rStart:rEnd]
                mouth = shape[mStart:mEnd]
                leftEAR = eye_aspect_ratio(leftEye)
                rightEAR = eye_aspect_ratio(rightEye)
                ear = (leftEAR + rightEAR) / 2.0
                leftEyeHull = cv2.convexHull(leftEye)
                rightEyeHull = cv2.convexHull(rightEye)
                mar = mouth_aspect_ratio(mouth)
                mouthHull = cv2.convexHull(mouth)

                # Drawing the overlay on the face
                cv2.drawContours(frame, [leftEyeHull], -1, (0, 255, 0), 1)
                cv2.drawContours(frame, [rightEyeHull], -1, (0, 255, 0), 1)
                cv2.drawContours(frame, [mouth], -1, (255, 0, 0), 1)
                cv2.putText(frame, "Eye Aspect Ratio: {}".format(ear), (5,
                50),
                cv2.FONT_HERSHEY_SIMPLEX, 0.7, (0,255,255), 2)
                cv2.putText(frame, "Mouth Aspect Ratio: {}".format(mar), (5,
                80),
                cv2.FONT_HERSHEY_SIMPLEX, 0.7, (0,255,255), 2)
                # Comparing threshold value of Mouth Aspect Ratio (MAR)
                if mar > mouthThresh:
                  flag_mouth += 1
                  if flag_mouth >= frame_check_mouth:
                        cv2.putText(frame,"*YOUAREYAWNING
        *",(10,370),cv2.FONT_HERSHEY_SIMPLEX, 0.7, (0,0,255), 2)
```

```
                    time.sleep(5)
                    p=multiprocessing.Process(target=playsound,
                    args=("Alarm.wav",))
                        p.start()
                        time.sleep(10)
                        p.terminate()
                        notify = Notify()
                        notify.send("HELP!!! THIS PERSON IS
                        FEELING DROWSY")
            else:
                flag_mouth = 0

            # Comparing threshold value of Eye Aspect Ratio (EAR)
            if ear < eyeThresh:
                flag_eye += 1
                if flag_eye >= frame_check_eye:
                    cv2.putText(frame,"****** YOU ARE SLEEPING
                *******",(10,400),cv2.FONT_HERSHEY_SIMPLEX
                , 0.7, (0, 0,255), 2)
                    time.sleep(5)
                    p=multiprocessing.Process(target=playsound,
                    args=("Alarm.wav",))
                    p.start()
                    time.sleep(10)
                    p.terminate()
                    notify = Notify()
                    notify.send("HELP!!! THIS PERSON IS
                    FEELING DROWSY")
            else:
                flag_eye = 0

        # Plotting the frame
        cv2.imshow("Frame", frame)

        # Waiting for exit key
        key = cv2.waitKey(1) & 0xFF
        if key == ord("q"):
            break

# Destroying all windows
cv2.destroyAllWindows()
cap.stop()
```

```
def main():
	helper()
if _name_ == '_main_':
	main()
```

utilities.py

```
from scipy.spatial import distance

def eye_aspect_ratio(eye):
	A = distance.euclidean(eye[1], eye[5])
	B = distance.euclidean(eye[2], eye[4])
	C = distance.euclidean(eye[0], eye[3])
	ear = (A + B) / (2.0 * C)
	return ear

def mouth_aspect_ratio(mouth):
	A = distance.euclidean(mouth[3], mouth[9])
	B = distance.euclidean(mouth[2], mouth[10])
	C = distance.euclidean(mouth[4], mouth[8])
	L = (A+B+C)/3
	D = distance.euclidean(mouth[0], mouth[6])
	mar=L/D
	return mar
```

10.2 SCREENSHOTS

EYE CLOSURE AND YAWN DETECTION

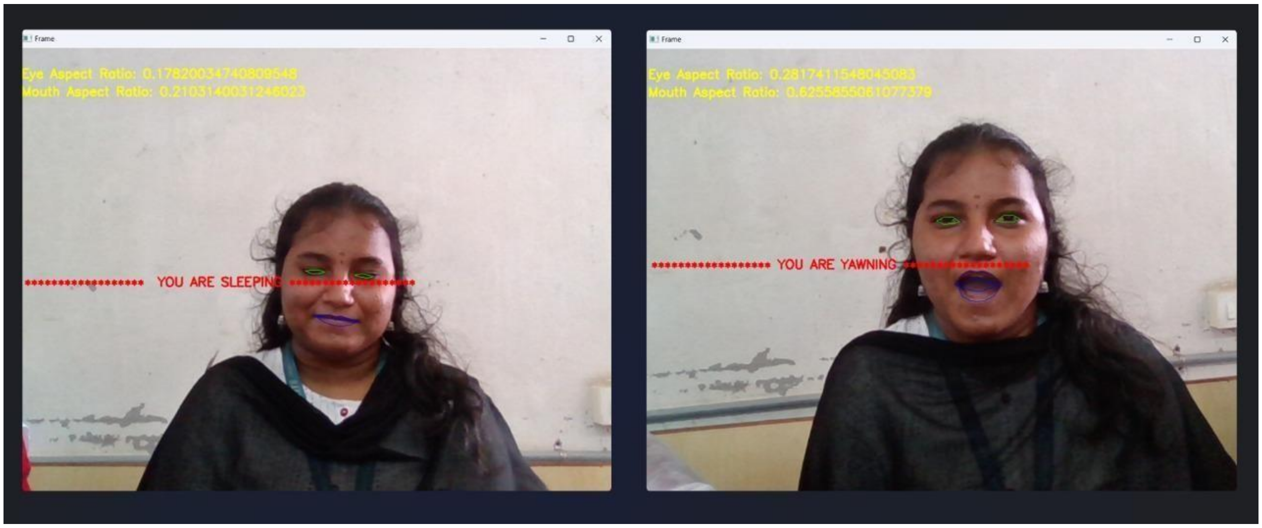


Fig 10.2.1 Drowsiness detection – Person 1

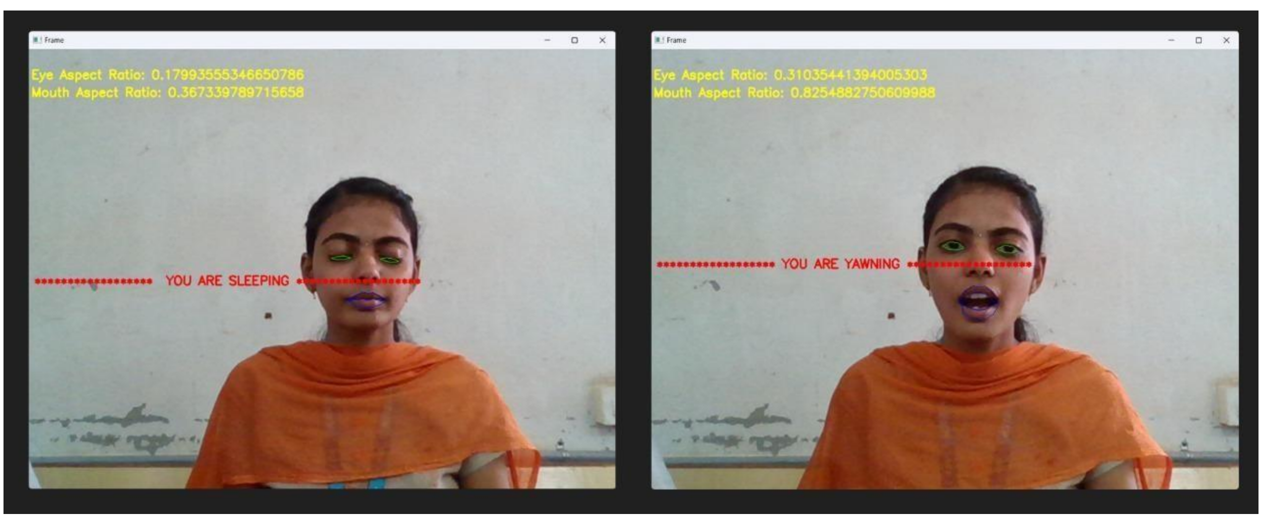


Fig 10.2.2 Drowsiness detection – Person 2

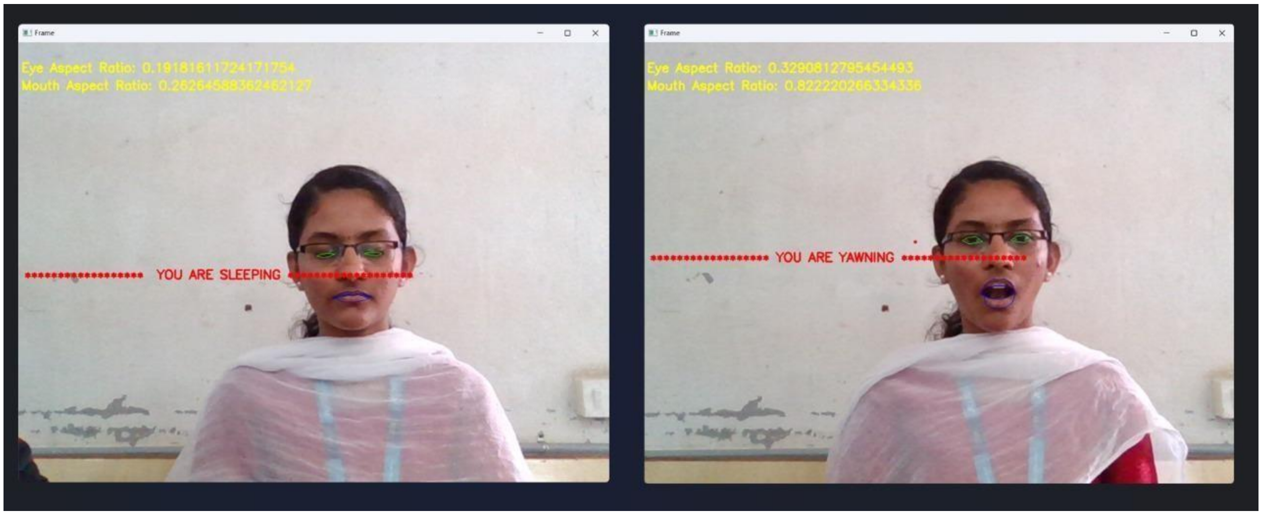


Fig 10.2.3 Drowsiness detection – Person 3

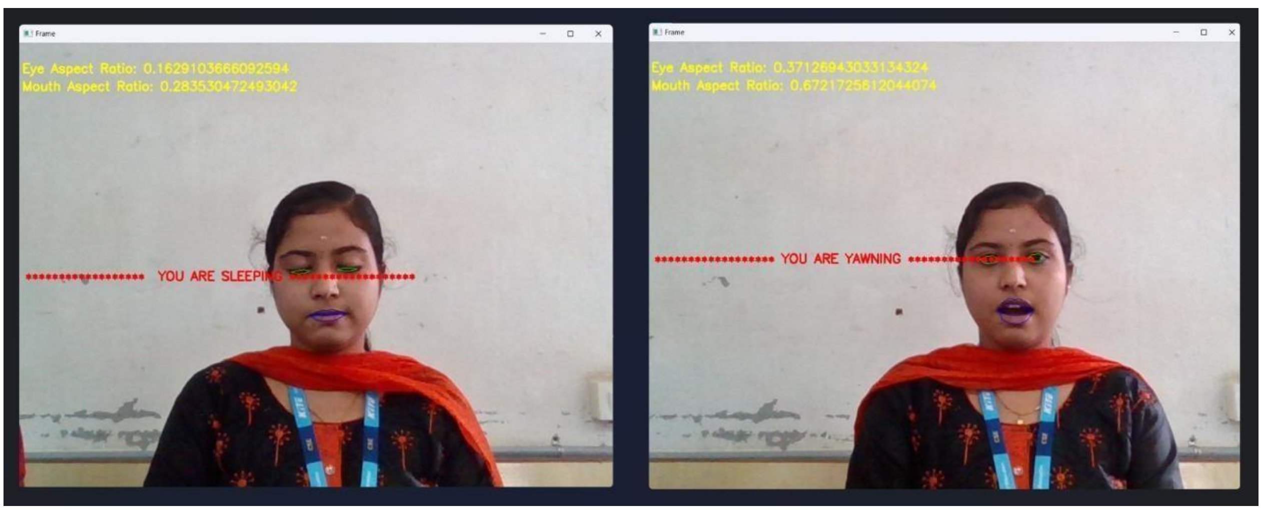


Fig 10.2.4 Drowsiness detection - Person 4

Text Alert to the concerned person

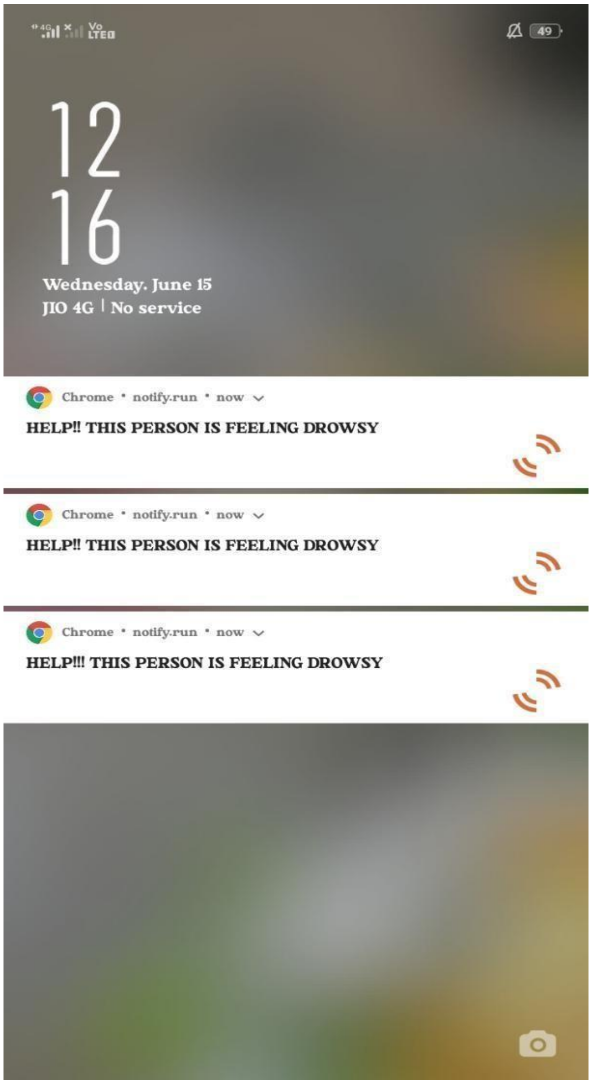


Fig 10.2.5 Text Alert

CHAPTER 11

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