

A Thesis/Project/Dissertation Report

on

DROWSY DRIVER ALERT SYSTEM

*Submitted in partial fulfillment of the
requirement for the award of the degree of*

**B. Tech in Computer Science and
Engineering with Specialization
Computer Networks and Cyber Security**



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**Under The Supervision of
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INDIA
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CANDIDATE'S DECLARATION

I/We hereby certify that the work which is being presented in the thesis/project/dissertation, entitled **“DROWSY DRIVER ALERT SYSTEM”** in partial fulfillment of the requirements for the award of the Bachelor of Technology in Computer Science and Engineering submitted in the School of Computing Science and Engineering of Galgotias University, Greater Noida, is an original work carried out during the period of **July, 2021 to December, 2021** under the supervision of **Ms. Heena Khara, Assistant Professor**, Department of Computer Science and Engineering/Computer Application and Information and Science, of School of Computing Science and Engineering , Galgotias University, Greater Noida

The matter presented in the thesis/project/dissertation has not been submitted by me/us for the award of any other degree of this or any other places.

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This is to certify that the above statement made by the candidates is correct to the best of my knowledge.

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Designation

CERTIFICATE

The Final Thesis/Project/ Dissertation Viva-Voce examination of Tushar Singh – 19SCSE1140049 and Shristy Kumari – 19SCSE1140005 has been held on _____ and his/her work is recommended for the award of Bachelor of Technology in Computer Science and Engineering.

Signature of Examiner(s)

Signature of Supervisor(s)

Signature of Project Coordinator

Signature of Dean

Date: November, 2013

Place: Greater Noida

Abstract

Drowsiness detection is a safety technology that can prevent accidents caused by drivers who fell asleep while driving. Every year many people lose their lives due to fatal road accidents around the world and drowsy driving is one of the primary causes of road accidents and death. Nearly 50% of road accidents are due to sleep-deprived drivers. The objective of this project is to alert the driver when drowsiness is detected.

To prevent these types of accidents a system can be developed that uses Python, OpenCV, and Cameras that will alert the person when they fall asleep. The priority of the project is to improve the safety of the driver. A camera will be installed in the vehicle and the system will monitor the eyes of the driver and detect the eye blinking. If the driver's eyes remain closed for more than a certain period then the system will detect the drowsiness and sound an alarm which will alert the driver.

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CHAPTER-1

Introduction

1.1 Introduction

Drowsy driving means operating a motor vehicle when a person is unable to remain alert due to lack of sleep. Driver drowsiness and fatigue is a major factor which results into numerous vehicle accidents. Many of these accidents happen on the highways and expressways, while there are several reasons behind these accidents, one of them is lack of sleep.

The latest statistics estimate that every year 1,200 people die and 76,000 injuries are caused by sleep-deprived-related accidents. India is one of the countries with an alarmingly high number of deaths attributed to road accidents. Not only casualties but a huge number of people get injured seriously every year due to road accidents and many of these people become handicapped every year.

The development of the technology which detects and prevents drowsiness at the wheel is a major challenge and will be a success in the field of accident and injuries avoidance systems. Because of the dangers that drowsiness causes on the roads, some methods must be developed for preventing its effects.

The project aims to develop a drowsiness detection and alert system. The system will focus on the design which will be in such a manner that it monitors accurately the opened or closed state of the driver's eye. The system will detect eye movements and blinking patterns.

1.2 Formulation of Problem

India is one of the countries with an alarmingly high number of deaths attributed to road accidents. In the last decade, road accidents caused death for 13 lakh people, and another 50-lakh people got injured in the country, as revealed by a study by World Bank.

Almost 50 percent of all fatal accidents are due to drowsy driving and 68 percent of adult drivers have driven a vehicle while feeling drowsy in the past year. Sleep-related crashes are most common in young people between the ages of 18 and 29.

There are many cases of accidents due to drowsiness and fatigue which needs a solution or at least some precautions and measures.

1.2.1 Tools and Technology Used

Hardware Requirements: Laptop, Camera, Monitor, Alarm, Keyboard

Software Requirements: OpenCV, Dlib, Python, Machine Learning

OpenCV

OpenCV 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 the commercial products. OpenCV is coded with optimized C and can take work with multicore processors.

Dlib

Dlib is a modern C++ toolkit containing machine learning algorithms and tools for creating complex software in C++ to solve real world problems. It is used in both industry and academia in a wide range of domains including robotics, embedded devices, mobile phones, and large high performance computing environments. Dlib's open-source licensing allows to use it in any application, free of charge.

Python

Python is a computer programming language often used to build websites and software, automate tasks, and conduct data analysis. Python is a general-purpose language, meaning it can be used to create a variety of different programs and isn't specialized for any specific problems. Python is a translated, high-quality, common purpose planning language. Python's design philosophy emphasizes code readability and its remarkable use of white space. Its language building and object-oriented approach aims to help program planners write clear, logical code for small and large projects. Python is dynamically typed AND supports multiple editing paradigms, including process, object orientation, and application.

Jupyter Lab

Project Jupyter is a non-profit organization created to develop open-source software, open-standards, and services for interactive computing across dozens of programming languages.

Image Processing

In computer science, digital image processing is the use of computer algorithms to perform image processing on digital images.

Machine Learning

Machine learning scientific research of algorithms and mathematical models of computer systems that they use to perform a specific task effectively without using explicit instructions, instead relying on patterns and understandings. It is seen as part of artificial intelligence. Machine learning algorithms create a mathematical model based on sample data, known as "training data", to make predictions or decisions without being told openly. The goal of machine learning is to turn data into information. After having learned from a gathering of data, we want a machine that is able to answer any question about the data like: what are the other data that are similar to given data? Is there a face in the image? What kind of ad will influence the user? Machine learning converts data into information by detecting rules or patterns from that data.

1.2.2 Requirement Analysis

Python: Python is the basis of the program in which the program will be written. It utilizes many of the python libraries.

Libraries:

Numpy: Pre-requisite for Dlib

Scipy: Used for calculating Euclidean distance between the eyelids.

Playsound: Used for sounding the alarm.

Dlib: This program is used to find the frontal human face and estimate its pose using 68 face landmarks.

Imutils: Convenient functions written for OpenCV.

OpenCV: Used to get the video stream from the webcam, etc.

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Literature Survey

The section introduces the literature survey of drowsiness detection. According to the survey on Driver Fatigue-Drowsiness Detection System, the detection system includes procedures for facial image extraction, blinking of the eye, removal of the eye area, etc.

Potential sleep deprivation strategies for drivers can be divided into the categories: sensing of physiological characteristics, sensing of driver operation, sensing of vehicle response, monitoring the response of the driver.

Among these methods, the best techniques, based on accuracy are those based on human physiological phenomena. This method is used in two ways: measuring changes in body signals, such as brain waves, heartbeat, and blinking; and measuring body changes such as posture, leaning on the driver's head and open or closed eye conditions.

The first procedure, although very accurate, is not realistic, because hearing the electrodes will need to be attached directly to the driver's body, which is why it irritates and disturbs the driver. In addition, prolonged driving can lead to sweating, reducing their ability to concentrate accurately.

The second method is best suited to real-world driving situations because it may not be accessible using video camera sensors to detect changes.

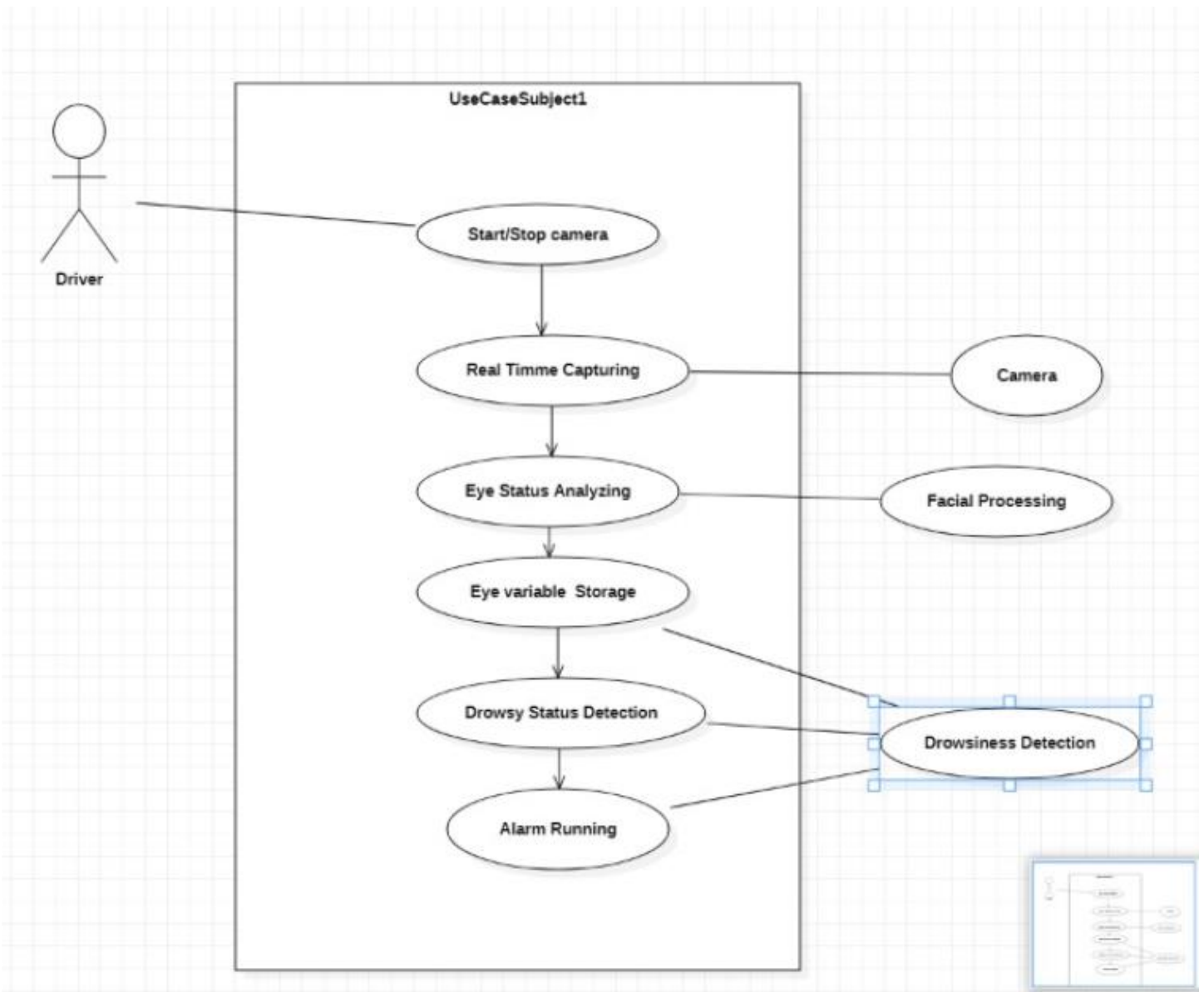
Driver performance and vehicle behavior can be done by monitoring the movement of the steering wheel, accelerator or brake patterns, vehicle speed, acceleration, and rear speed. These are also non-photographic ways to get drowsy but are limited to the type of car and the driver's condition. The final procedure for getting drowsiness is 12 to monitor the driver's response. This includes asking the driver from time to time to send feedback to the system to indicate alertness. The problem with this program is that it will eventually annoy and annoy the driver.

CHAPTER-3

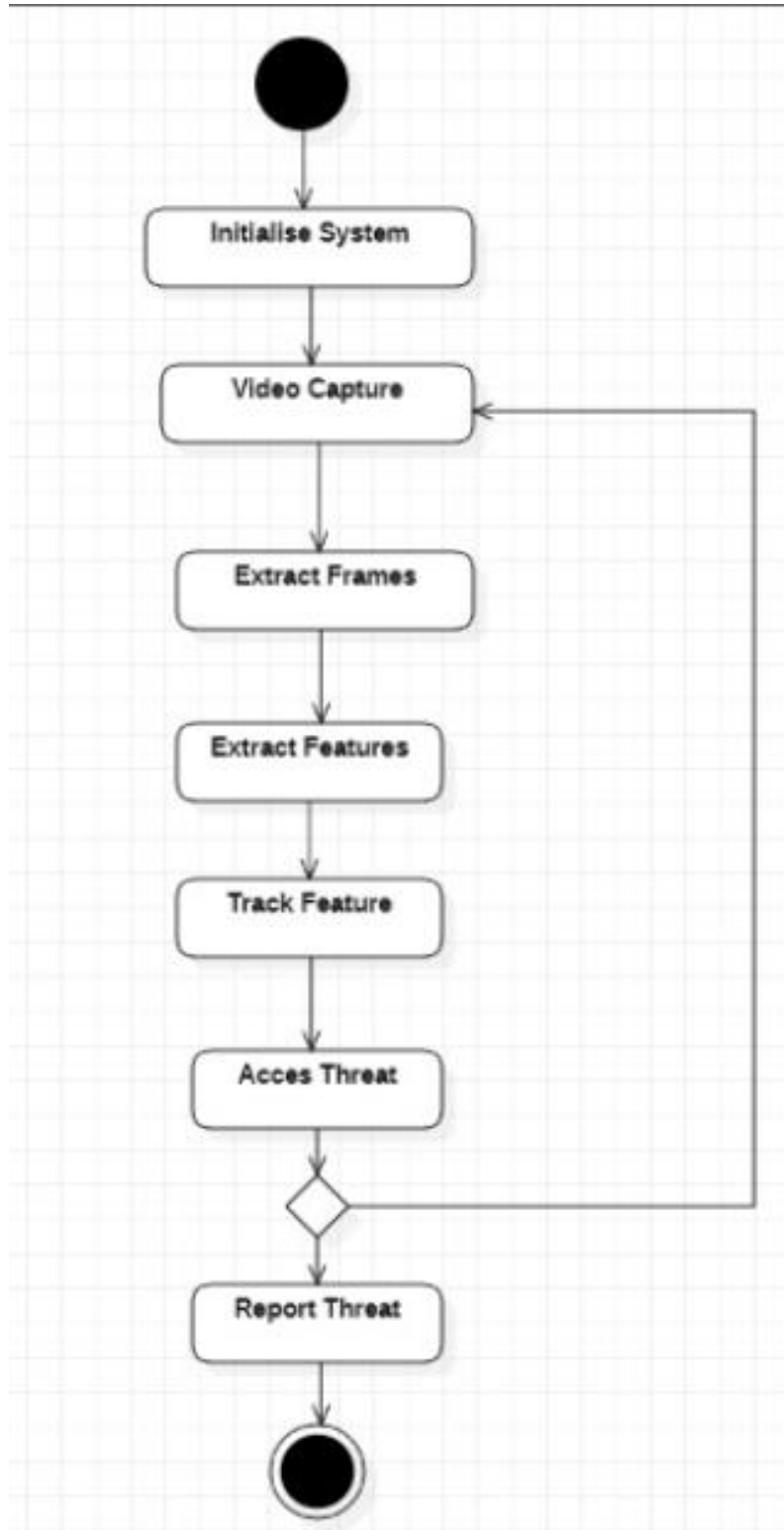
Working of the Project

Design of the system

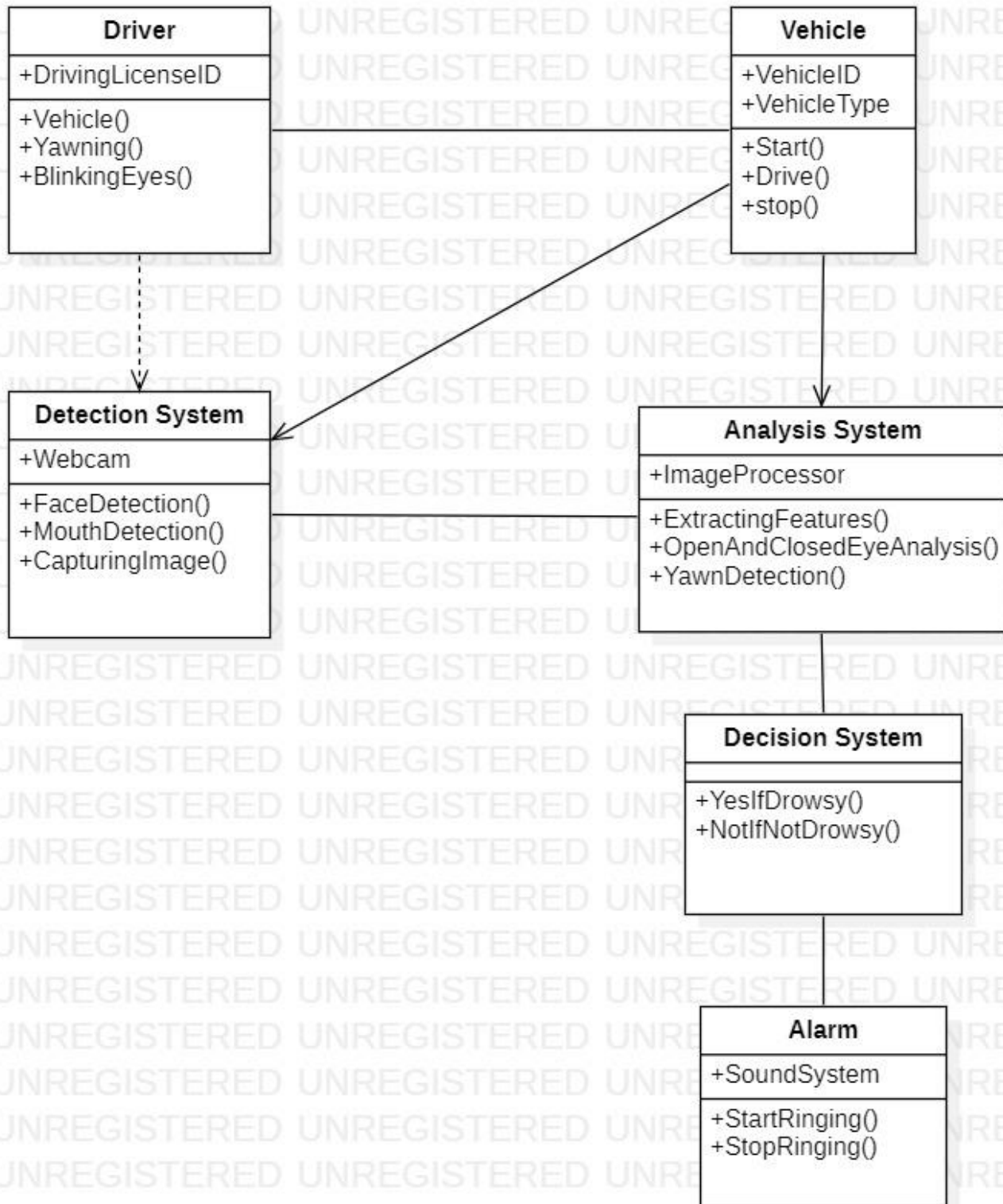
Use-Case Diagram



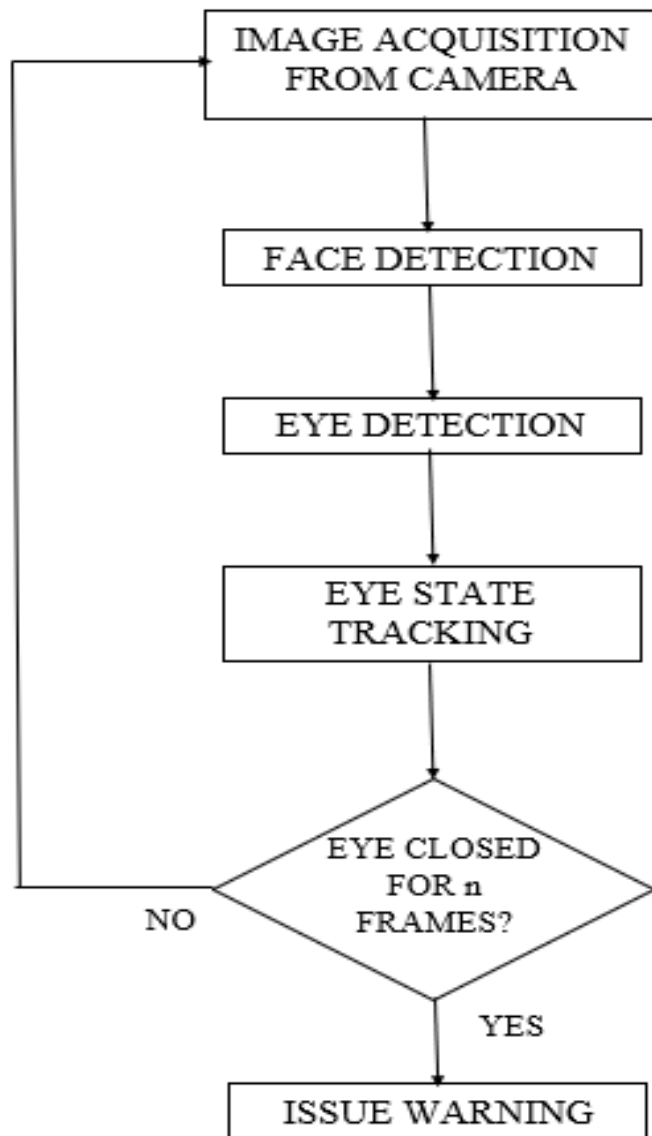
Activity Diagram



Class Diagram

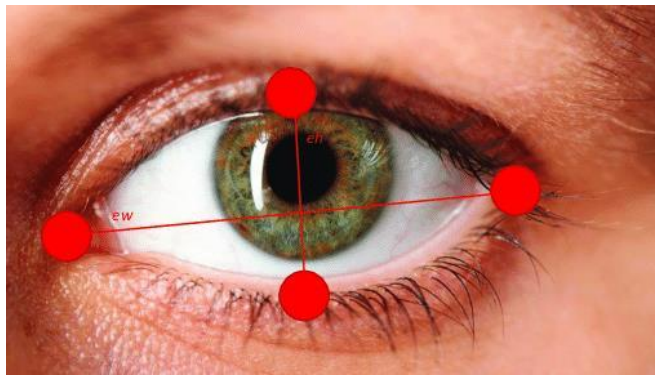


The system contains a camera that will be attached to the vehicle above or between the steering wheel from where it can detect the face easily. The first step will be for the camera to recognize and detect the edges of the face of the driver. After the detection of the face, it will detect the eyes and focus on the movement of the eyes. The camera will monitor the eye's movement and track the state of the eye whether it is open or close. There will be no issue if the movements of the eyes are normal but if it detects the eyes closed or some kind of drowsiness for a certain period then it will sound an alarm that will alert the driver and the driver would gain his consciousness.

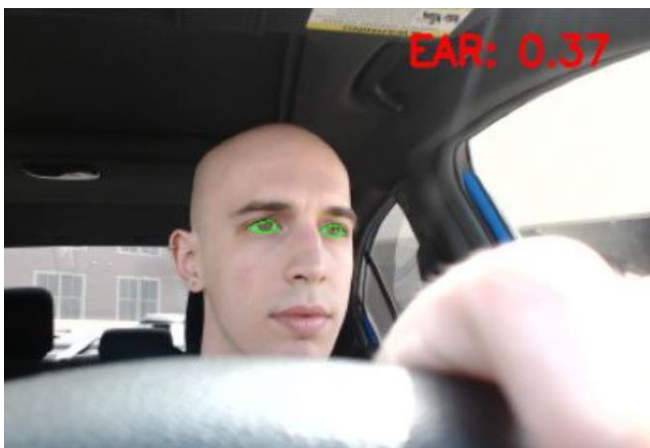


The framework is made by utilizing the incremental model. The center model of the framework is created first and afterwards increased in this way in the wake of testing at each turn. The underlying undertaking skeleton was refined into expanding levels of ability. At the following incremental level, it might incorporate new execution backing and improvement.

In this program, Dlib is used, a pre-trained program trained on the HELEN dataset to detect human faces using the pre-defined 68 landmarks. After passing the video feed to the dlib, frame by frame, it will be able to detect the features of left eye and right eye in the face. Then the outline will be drawn using the OpenCV. Using Scipy's Euclidean function, sum of both eyes' aspect ratio is calculated which is the sum of two distinct vertical distances between the eyelids divided by its horizontal distance.



So, the checking will be done and if the aspect ratio value is less than 0.25 then an alarm will be sounded and the driver is warned. (0.25 was chosen as a base case)



Non - Drowsy Person



Drowsy Person

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Results and Discussion

Testing is performed manually

Test ID	Test Case Title	Test Condition	System Behavior	Result
1	Test 1	Straight face, good light, without glasses.	Non-drowsy	Non-drowsy
2	Test 2	Tilted face, good light, without glasses.	Drowsy	Drowsy
3	Test 3	Tilted face, good light, with glasses.	Drowsy	Drowsy

This section presents the results of the discovery of visual sleep indicators. Collecting a set of data to properly test the system is challenging, this is because dangerous drowsiness events are not guaranteed to occur during daily driving test applications.

Test	Number of observations	Number of hits	Percentage of hits
Yawn detection	170	143	84.11 %
Front nodding	200	184	92.0 %
Assent of the head to the right	200	190	95.0 %
Assent of the head to the left	200	191	95,5 %
Distraction to the right	200	184	92.0 %
Distraction to the left	200	193	96.5 %
Blink detection	200	197	98.5 %

Detection levels for drowsiness parameter under normal conditions.

Test	Number of observations	Number of hits	Percentage of hits
Driver with a cab	1400	1295	92.5 %
Driver with glasses	1400	1183	85.5 %

Detection levels for different drowsiness parameter under special conditions.

CHAPTER-5

Conclusion and Future Scope

Conclusion

There are many products out there that provide a measure of fatigue quality for drivers used in many vehicles. Driver drowsiness detection system provides the same functionality but with better results and more benefits. Also, notify the user when he or she reaches a certain point of full drowsiness. It meets the objectives and requirements of the program. The framework has achieved a stable state in which all distractions have discarded. Framework clients are familiar with outline and understand the focus points and the truth it takes caring for the issue of depression in people related to fatigue and drowsiness issues while driving.

Future Scope

The model can be continuously developed using other similar parameters like blinking level, yawning, vehicle position, etc. If all these restrictions apply can improve accuracy a lot.

We plan to continue the work on the project by adding a sensor to track heartbeat to prevent accidents caused by a sudden heart attack to drivers. The same model and techniques can be used for a variety of other things like Netflix and other streaming services can detect when a user is asleep and pause the video accordingly. It can also be used in an app that prevents the user from falling asleep.

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