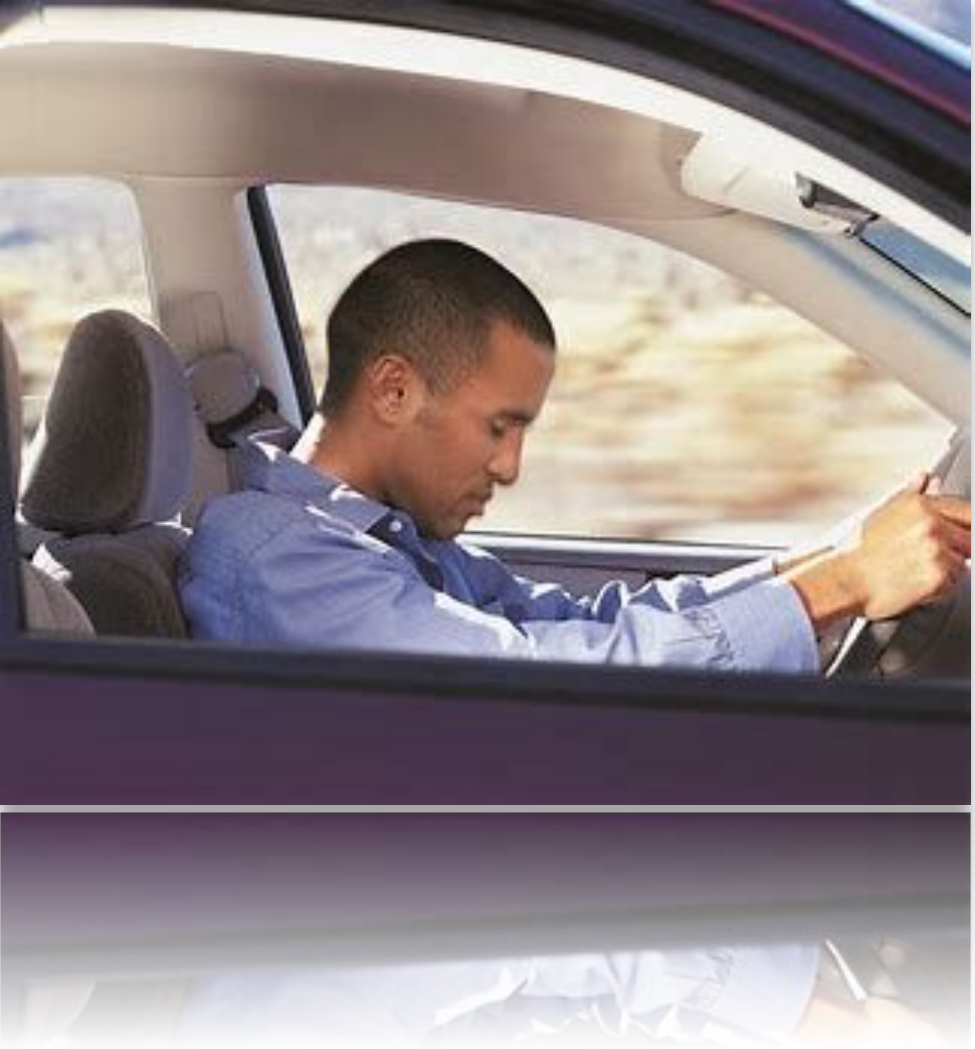

VIGILDRIVE

Drowsiness Detection System and Alarm for Drivers

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INTRODUCTION

A significant contributor to road accidents, particularly on rural roads, is driver fatigue and monotony. Fatigue compromises a driver's perception and decision-making abilities, leading to a decline in steering performance after 2-3 hours of continuous driving. Various studies have suggested that around 20% of all road accidents are fatigue-related, up to 50% on certain roads. Driver drowsiness detection is a car safety technology which helps prevent accidents caused by the driver getting drowsy.

PROBLEM STATEMENT

Drowsiness while driving is a significant issue leading to numerous accidents worldwide. The absence of an effective solution to detect and address driver drowsiness in real-time contributes to the persistence of this issue. There is an urgent need for an effective solution that can detect driver drowsiness and alert them in time to prevent accidents and enhance road safety.

ABSTRACT

In our dynamic world, road safety is a critical concern, with drowsy driving posing a significant threat. This abstract introduces a novel Drowsiness Detection System (DDS) utilizing OpenCV, an open-source computer vision library, to elevate road safety. The DDS continuously analyzes real-time video feeds from onboard cameras, extracting crucial facial and eye features through OpenCV's robust image and video processing capabilities. Core components include face and eye detection, monitoring eye activity. OpenCV enables efficient preprocessing, feature extraction, and model integration. The trained model alerts drivers upon detecting signs of drowsiness, leveraging computer vision to potentially prevent accidents. The DDS presents a promising, cost-effective solution, using OpenCV to enhance road safety and safeguard lives.

PURPOSE

The purpose of “VigilDrive” is to use free python libraries like OpenCV to develop a Drowsiness Detection System for enhancing road safety. The system analyzes real-time video feeds from in-car cameras to detect driver drowsiness and promptly alerts the drivers, thereby mitigating the risks associated with drowsy driving, ultimately ensuring the safety of both drivers and pedestrians on the road.

GOALS

- **Driver Safety**-The primary goal of a drowsiness detection system is to enhance driver safety by identifying instances where a driver may be at risk of falling asleep or losing focus while driving
- **Real-time Monitoring**- It refers to the continuous and immediate assessment of the driver's behavior and physiological indicators while they are operating a vehicle.
- **Drowsiness Detection-**It involves the identification of signs and patterns associated with driver fatigue or sleepiness.The system may use various inputs, such as facial recognition, eye movement tracking etc.
- **Early Warning** - They are mechanisms that alert the driver as soon as signs of drowsiness are detected.Warnings can be delivered through auditory alerts, visual signals to prompt the driver to take corrective action, such as pulling over for a break.

LITERATURE REVIEW

- A Survey on Driver's Drowsiness Detection Techniques[1]

  Eye Blinking-based technique measures the eye blinking rate and eye closure duration to detect drowsiness. Changes in eye blinking and gaze between eyelids during drowsiness are distinct from normal situations. The system monitors the position of irises and eye states over time to estimate eye blinking frequency and eye closure duration. Remote cameras capture video, and computer vision methods sequentially localize face, eyes, and eyelids positions to calculate the closure ratio.

- A Survey on State-of-the-Art Drowsiness Detection Techniques[2]

  Drowsiness detection methods are generally classified into three main categories:

  1) Behavioral parameter-based techniques
  2) Vehicular parameters-based techniques
  3) Physiological parameters-based techniques

LITERATURE REVIEW

- A Review on Driver Face Monitoring Systems for Fatigue and Distraction Detection[3]

  The simplest symptom to detect drowsiness is eye closure. Despite the simplicity of this symptom, it provides very useful information about drowsiness and even driver anesthesia. Eye closure can be used in two different forms for detection of driver drowsiness: (1) continuous eye closure and (2) percentage of the eye closure in a certain period of time.

- Real-Time Eye Blink Detection using Facial Landmarks[4]

  In landmark-based drowsiness detection, the face is localized using algorithms like HOG + Linear SVM and OpenCV's Haar cascade. The dlib library and OpenCV then construct a facial landmark. Facial structures within the bounding box are identified by referencing specific index ranges. Eye Aspect Ratio (EAR) detects blinking reliability.

TECHNOLOGY STACK

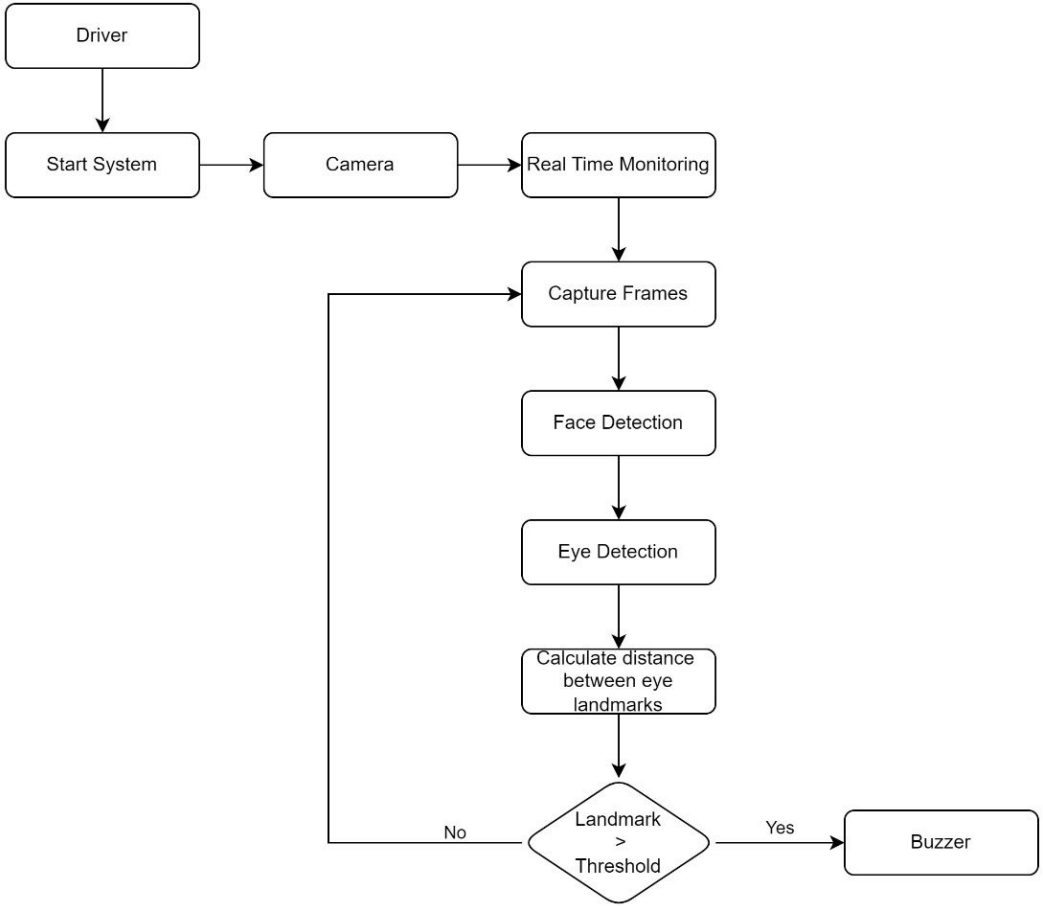
- Python

Libraries used:

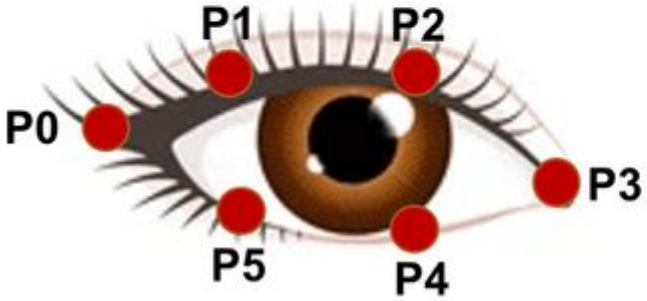
1. OpenCV
2. Imutils
3. Scipy
4. Pygame
5. Dlib

Methodology

Flow Chart For Drowsiness Detection System



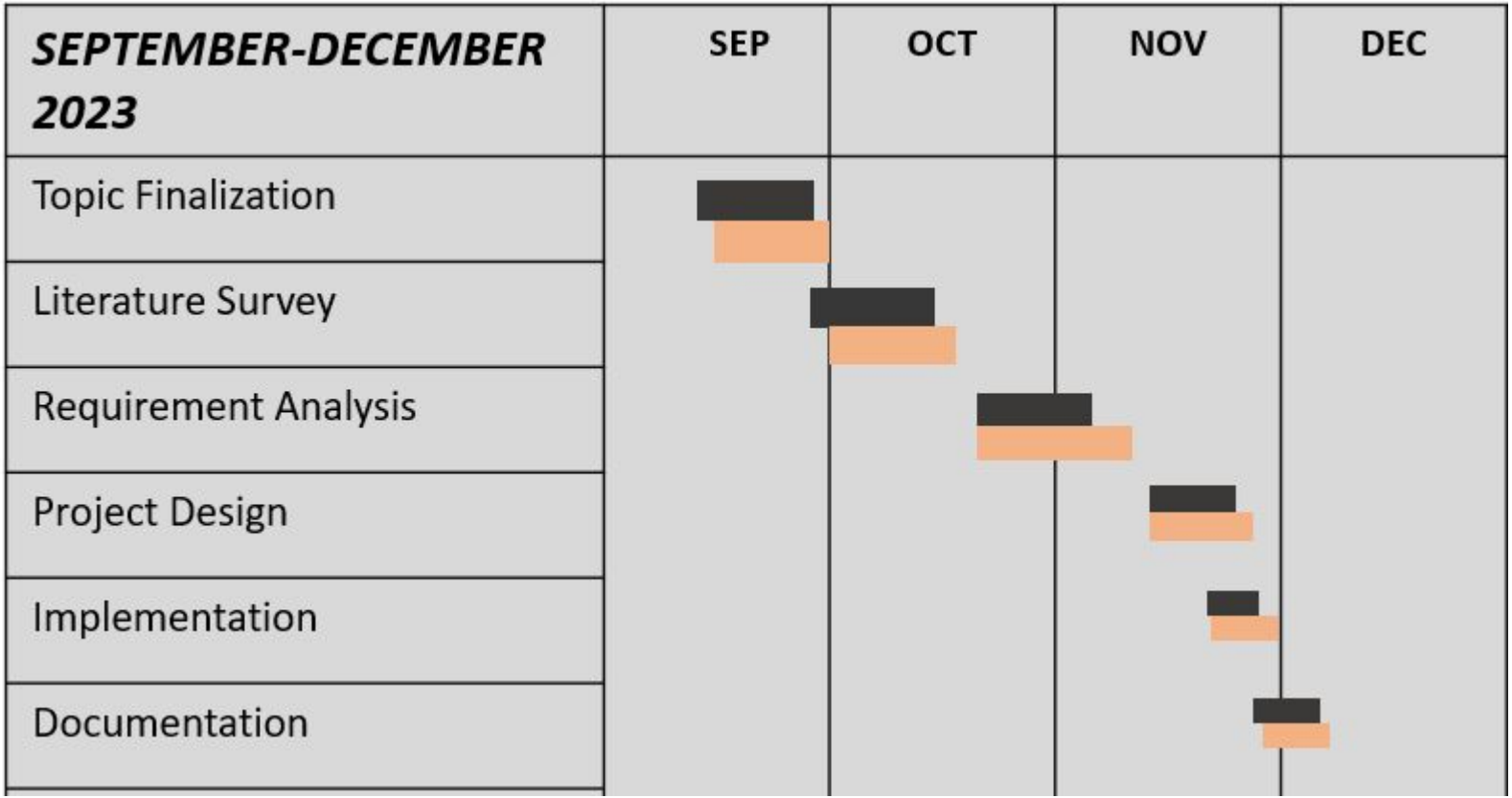
Eye Aspect Ratio (EAR)



$$EAR = \frac{\|p1 - p5\| + \|p2 - p4\|}{2\|p0 - p3\|}$$

RESULT

GANTT CHART


SEPTEMBER-DECEMBER 2023
SEP
OCT
NOV
DEC
Topic Finalization
Literature Survey
Requirement Analysis
Project Design
Implementation
Documentation

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[4] Tereza Soukupova and Jan Cech, "Real-Time Eye Blink Detection using Facial Landmarks", 21st Computer Vision Winter Workshop, Luke Cehovin, Rok Mandeljic, Vitomir Struc (eds.) Rimskke Toplice, Slovenia, February 3- 5 2016.

Thank You!