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Department of Artificial Intelligence and Machine Learning

with B++ Grade

Real Time Drowsiness Alert System

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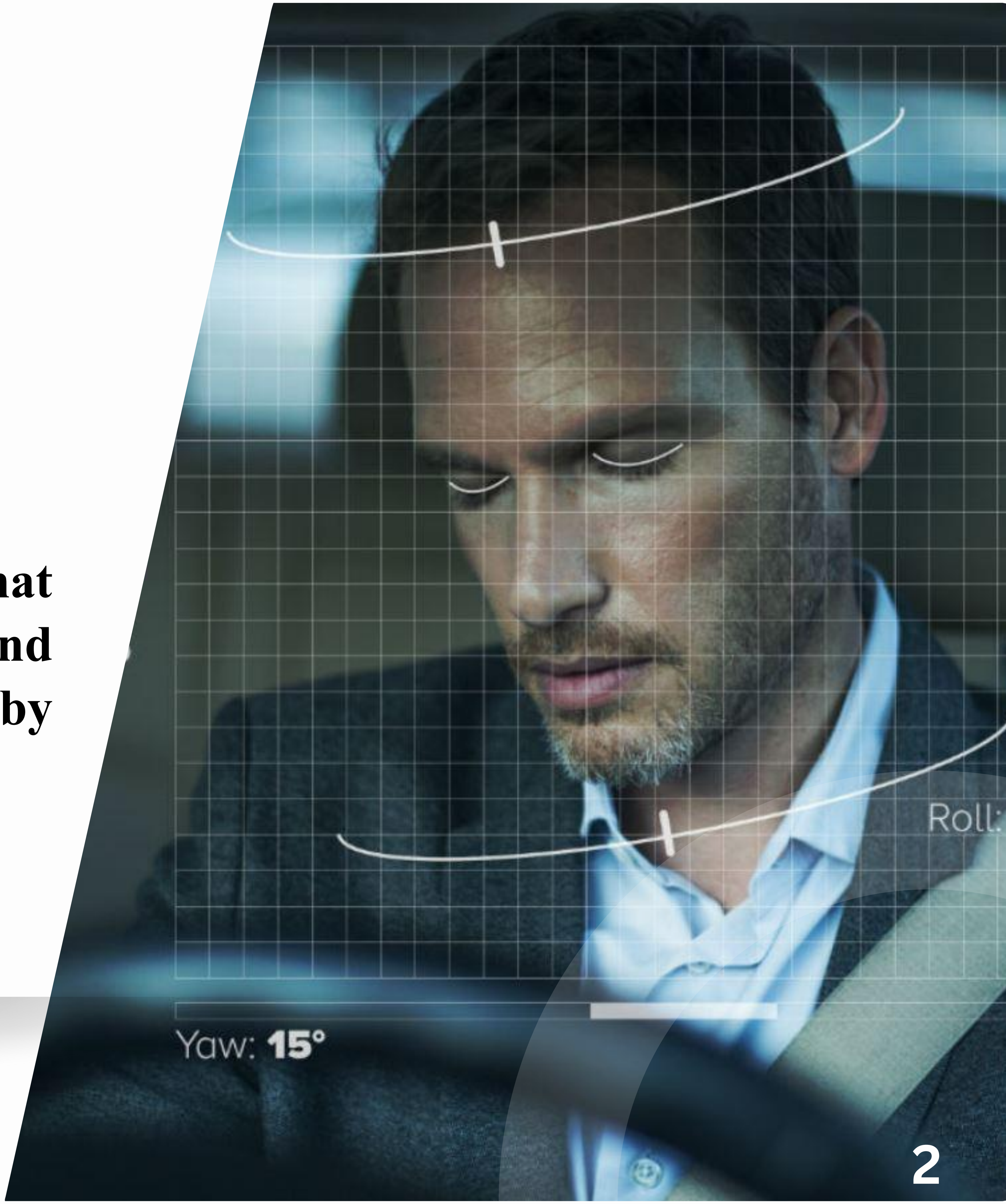
INTRODUCTION

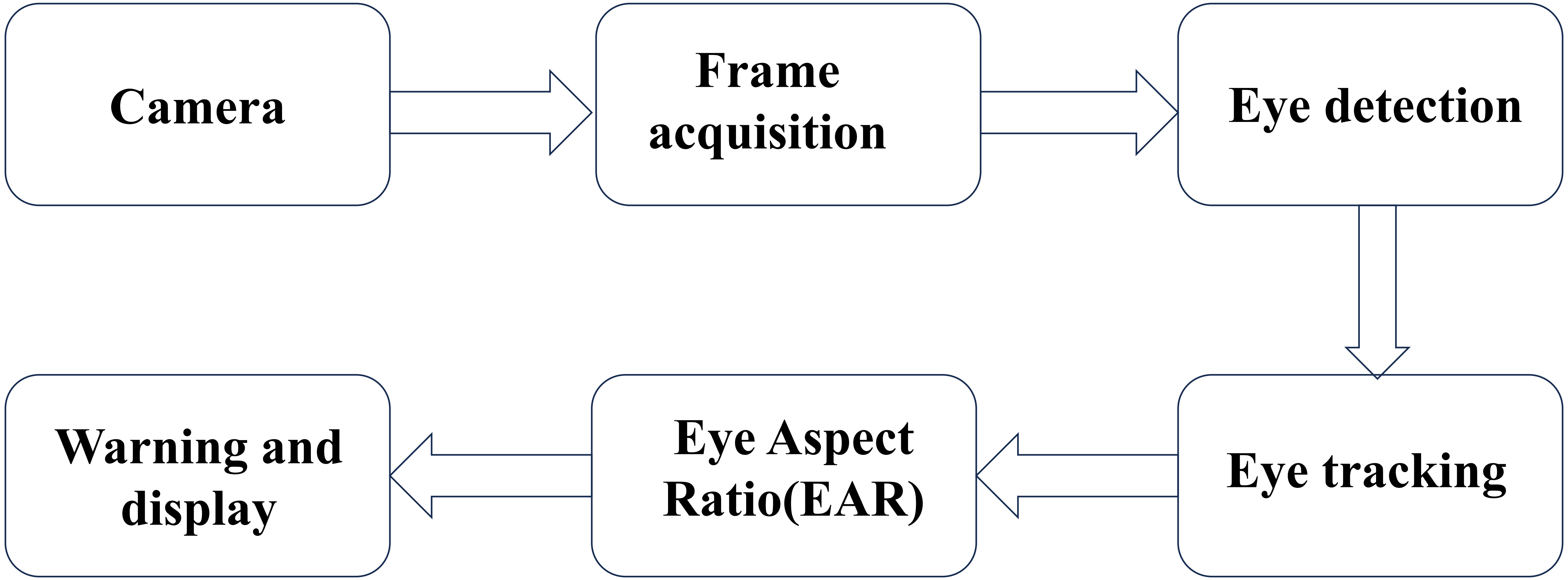
This project presents a Drowsiness Detection System that uses computer vision to monitor eye movements and detect signs of fatigue. By calculating the Eye Aspect Ratio (EAR), the system identifies when the eyes are closed for too long and triggers an alert. It utilizes dlib for facial landmark detection and OpenCV for video processing, making it useful for applications like driver safety and fatigue monitoring.

Problem Statement

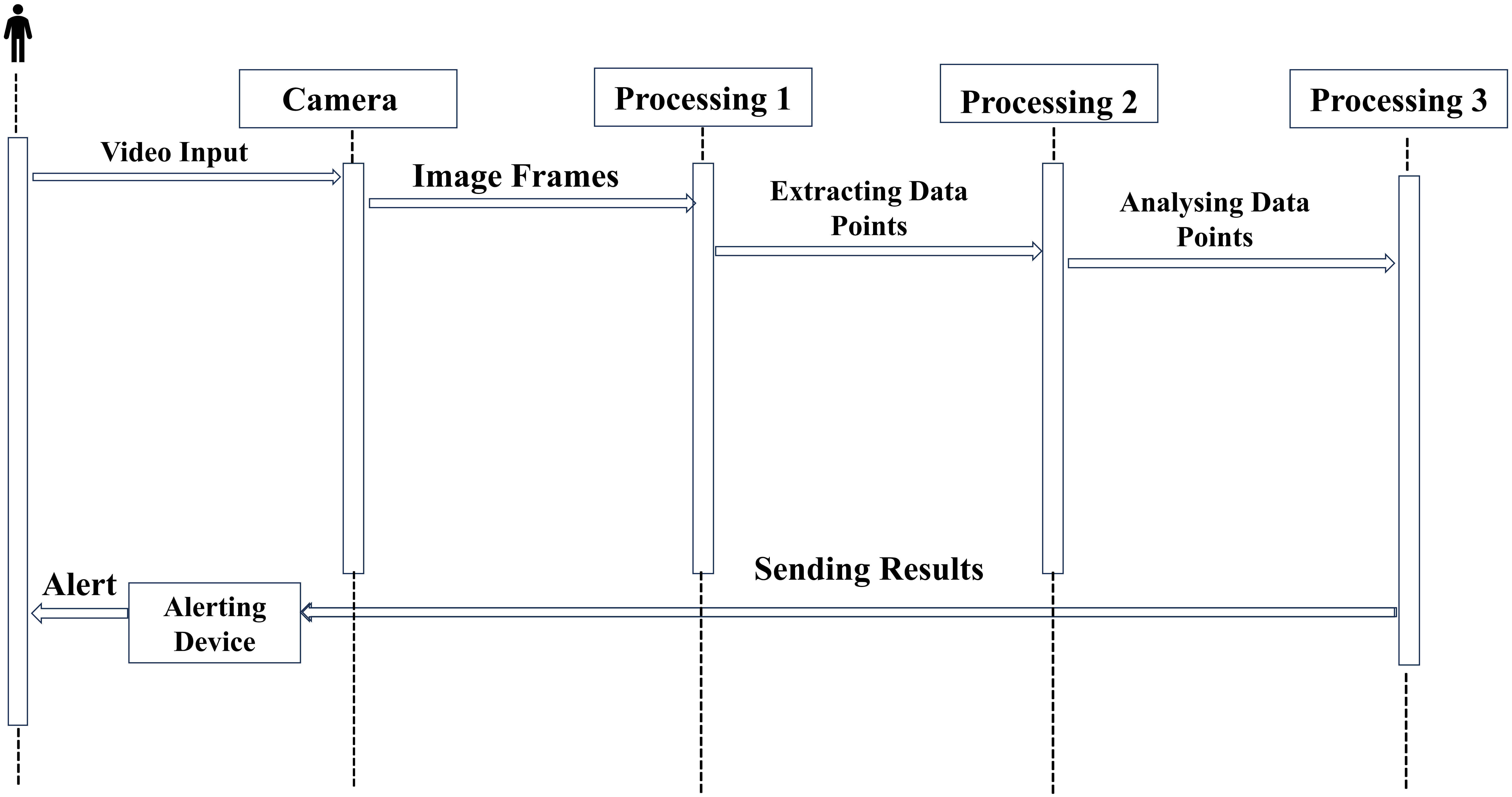
To develop a real-time drowsiness detection system that monitors a person's eye movements using a webcam and alerts them when signs of drowsiness are detected, thereby preventing accidents caused by fatigue.



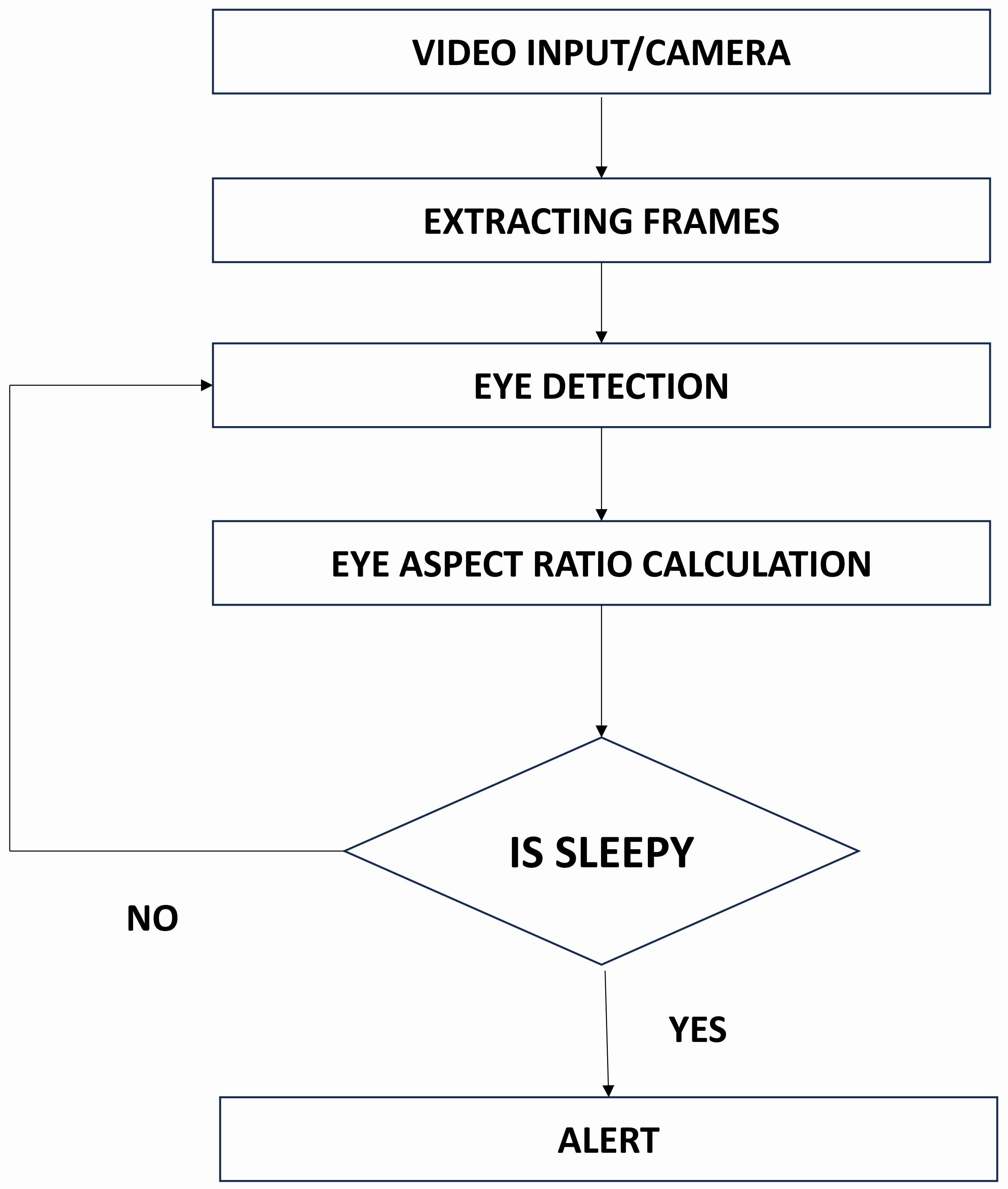
System Design



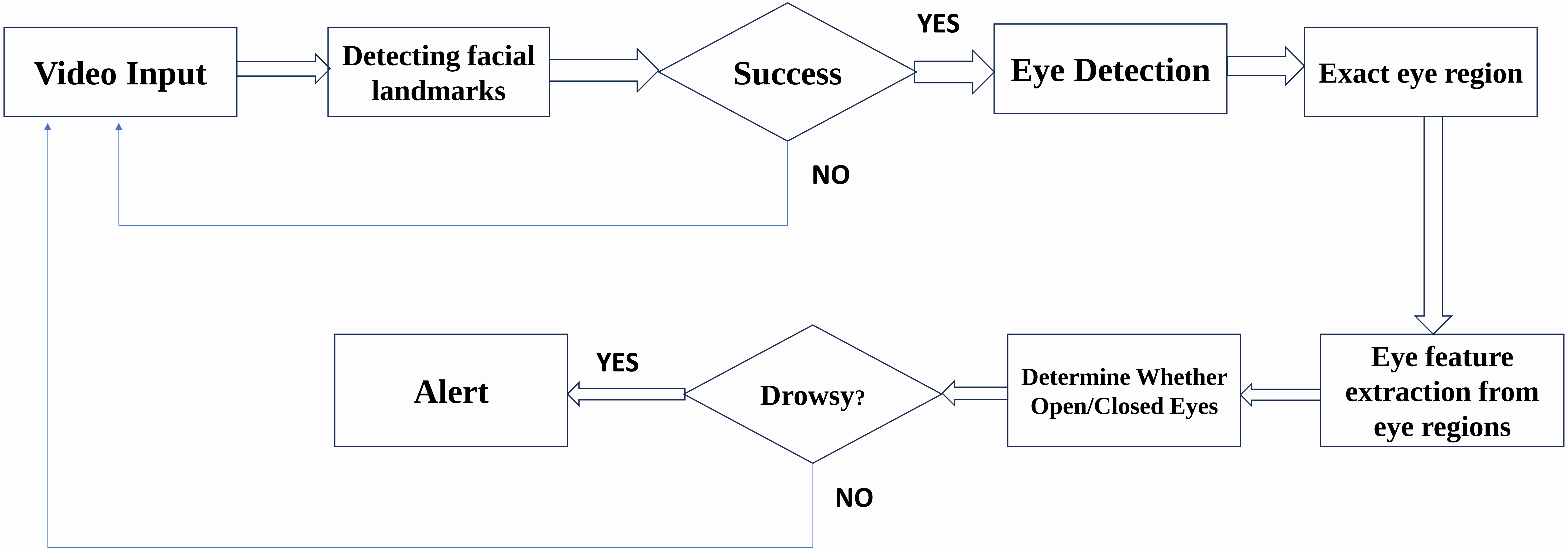
Sequence Diagram



Dataflow Diagram



Flowchart


Video Input
Detecting facial landmarks
Success
YES
NO
Eye Detection
Exact eye region
Eye feature extraction from eye regions
Determine Whether Open/Closed Eyes
Drowsy?
YES
NO
Alert

Implementation

SOFTWARE REQUIREMENTS:

Programming Language: Python 3.x
Libraries: OpenCV, dlib, scipy, imutils, winsound
Tools: Webcam for video input
Pre-trained Model:shape_predictor_68_face_landmarks.dat for facial landmark detection.

HARDWARE REQUIREMENTS:

Webcam: For capturing real-time video input.
RAM : Minimum 4GB
Processor: Multi-core processor for efficient video processing.
Display: Monitor for visual output and alerts.
Speaker: For audible alarm notifications.

Preprocessing

- Real-time video frames are captured using a webcam.
- Frames are converted to grayscale to simplify computations and improve processing speed.
- The dlib face detector identifies the face region in each frame.
- Specific points around the eyes are extracted using a pre-trained 68-point facial landmark model.
- The landmarks are used to isolate the left and right eye regions for further analysis.

Segmentation

1.Data Collection:

- Capturing video feed from a camera (webcam or surveillance) to detect facial landmarks and eye movements.

2. Preprocessing:

- Converting video frames to grayscale. Face detection using a facial landmark detector (e.g., dlib).

- Extracting eye regions from the detected face.

3. Feature Extraction:

- Calculating the Eye Aspect Ratio (EAR) to measure the openness of the eyes.

4. Drowsiness Detection:

- Comparing the EAR value to a threshold to detect drowsiness.

5. Alert System:

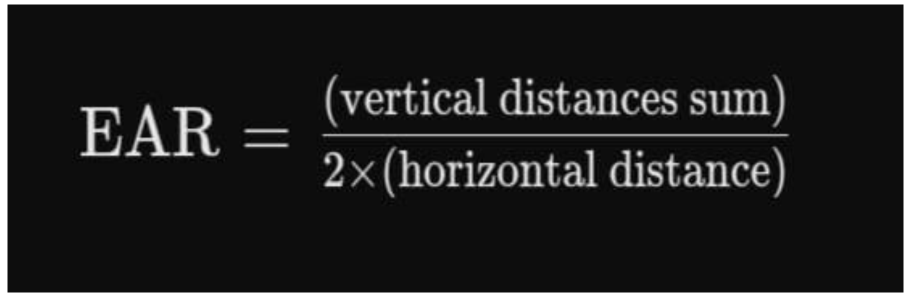
- Triggering an alert (e.g., beep sound) when drowsiness is detected.

6. Testing & Evaluation:

- Testing the system under different conditions (lighting, head movement) to evaluate its accuracy, precision, and real-time performance.

Feature Extraction

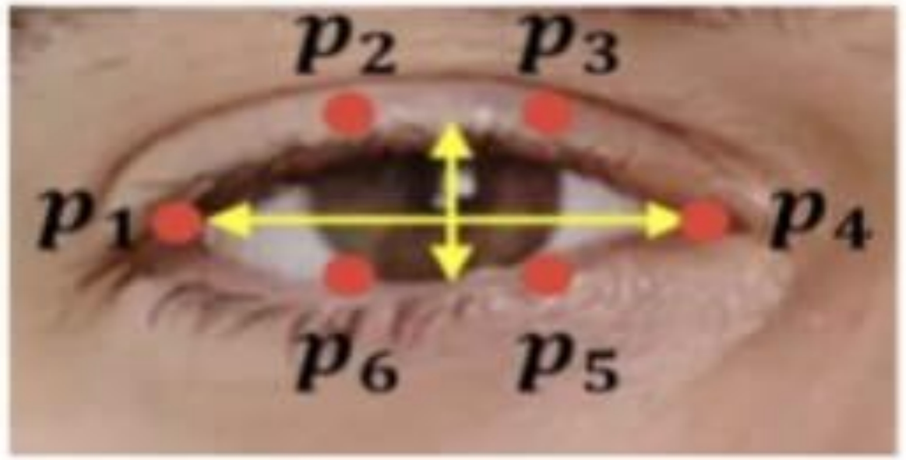
- **Feature Extraction** in the drowsiness detection system involves three key steps. First, **facial landmark detection** is performed using dlib’s 68-point model to identify key facial landmarks, specifically around the eyes.
- Next, the **Eye Aspect Ratio (EAR)** is calculated by measuring the vertical and horizontal distances between the eye landmarks, which helps determine the openness of the eyes.



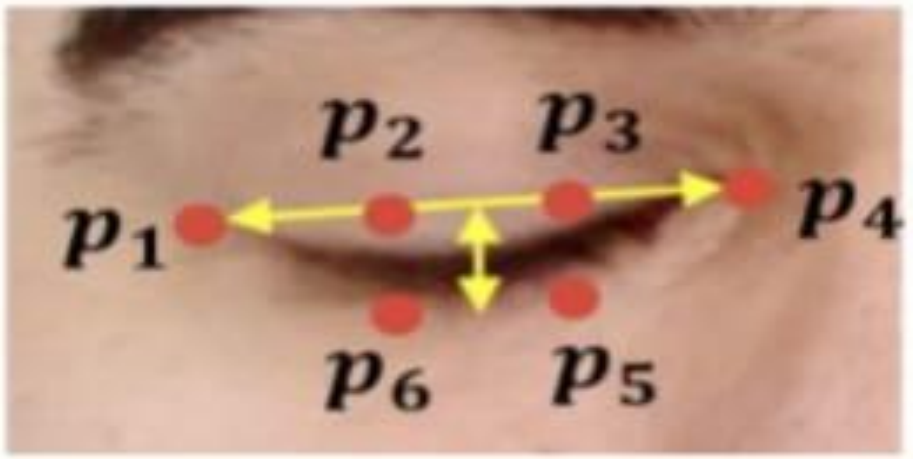
$$\mathrm{EAR} = \frac{(\text{vertical distances sum})}{2\times(\text{horizontal distance})}$$

- Finally, the system compares the average EAR of both eyes to a predefined threshold. If the EAR remains below this threshold (0.25) for several consecutive frames, it signals potential drowsiness.

Performance Measure



Open eye will have more EAR



Closed eye will have less EAR

- **Accuracy** is **85% to 95%** under ideal conditions like good lighting, stable camera.
- Whether the system can process video frames fast enough to provide real-time drowsiness detection without significant lag.
- The time it takes for the system to detect drowsiness and trigger an alarm. A faster response time is better.

Testing

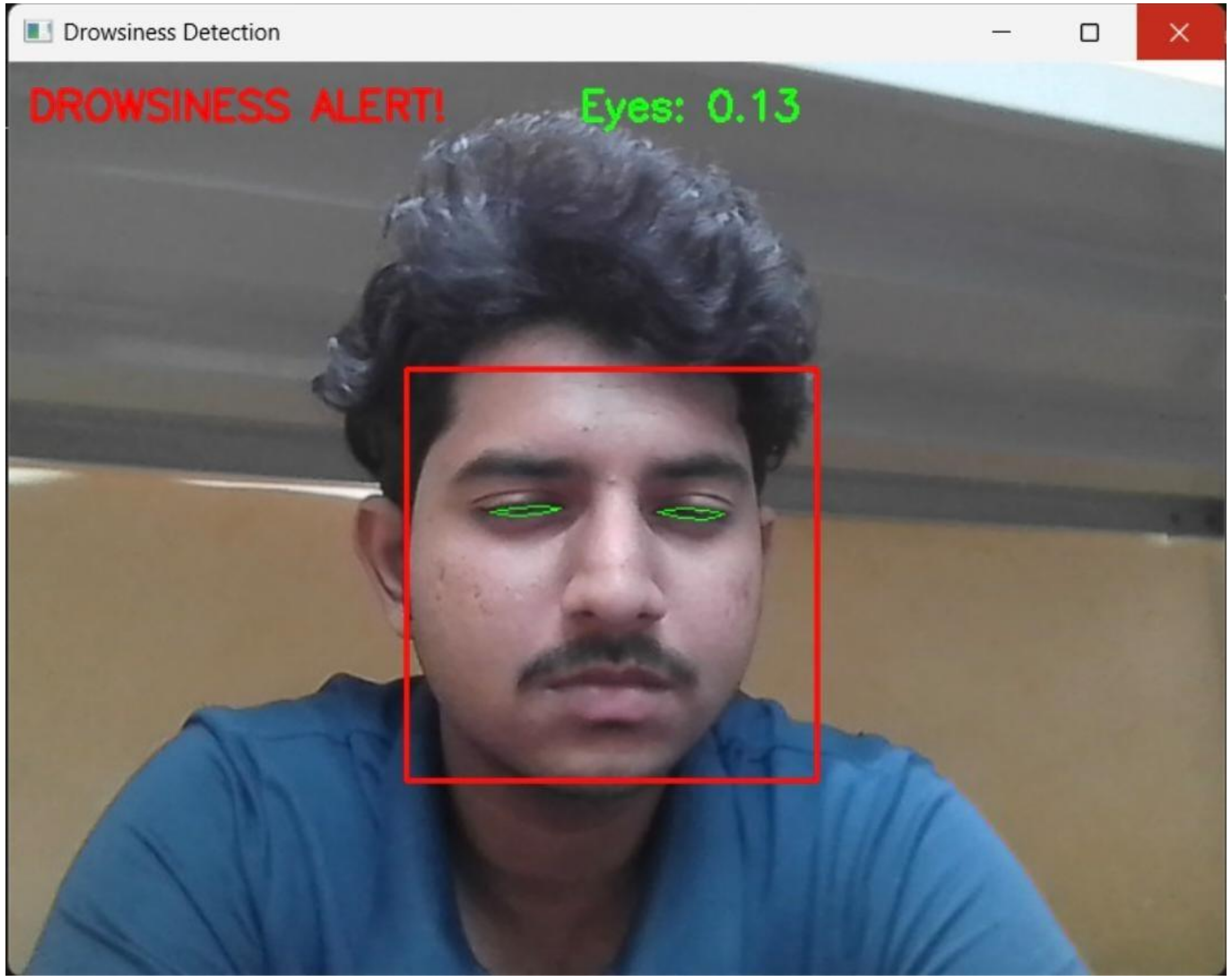
Real-time Testing:

-Test with Live Video Feed:
-Use a webcam or a video camera to test the system in real-time.
-Monitor how the system detects drowsiness and triggers alerts when the user shows signs of fatigue.

Long-duration Testing:

Fatigue Simulation:
Simulate prolonged use by testing with users who are gradually becoming drowsy over time.

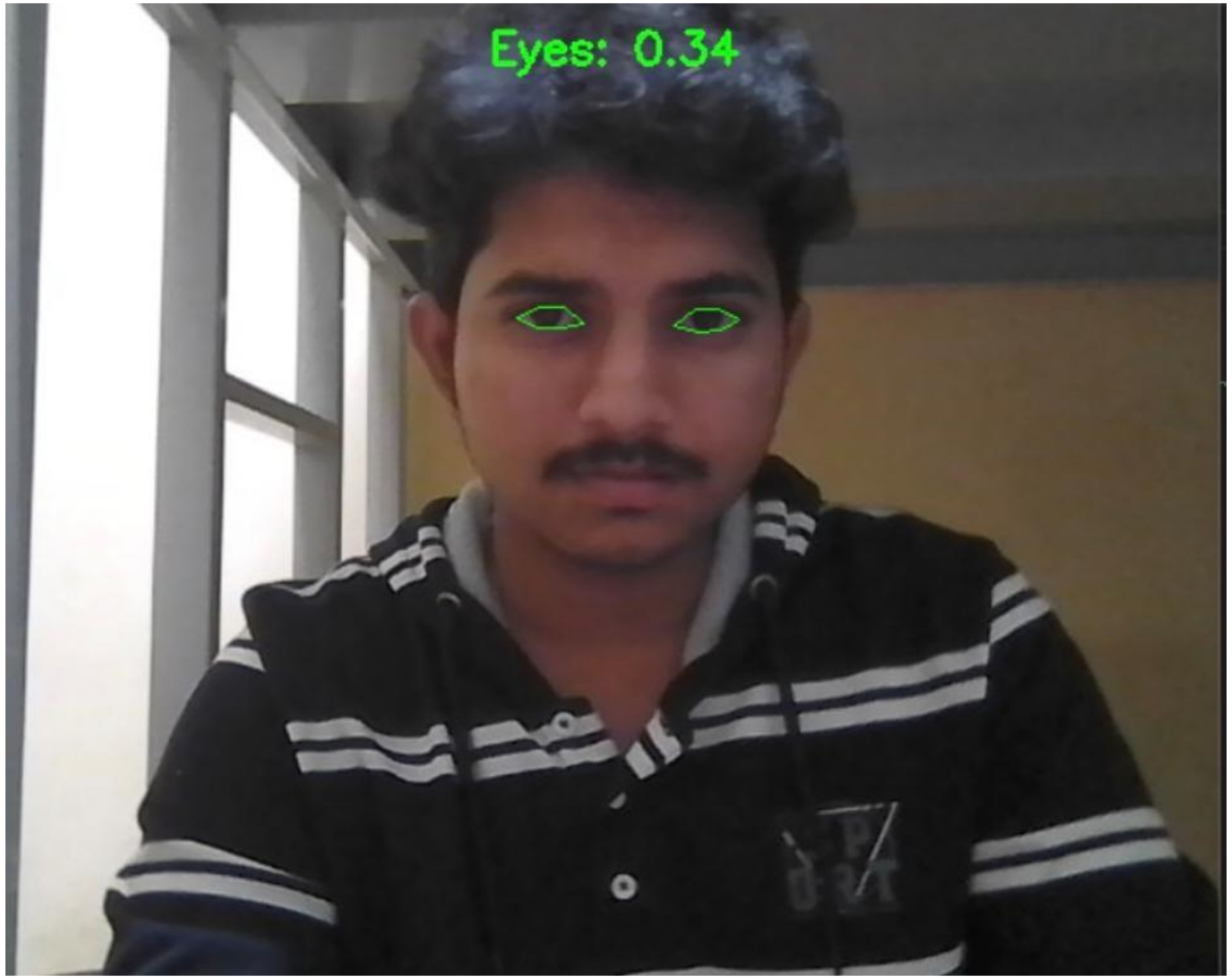
RESULTS



DROWSINESS ALERT!

Eyes: 0.13

FIG1:CLOSED EYE



Eyes: 0.34

FIG2: OPEN EYE

Conclusion

The drowsiness detection system effectively identifies fatigue using eye movement analysis, providing timely alerts to prevent accidents. With an accuracy of 85% to 95%, it performs well under various conditions and can be further optimized for better reliability and safety in real-world applications.

References

- **Kasarapu, R., Maheswari, G. U., Krishna, K. P., Meghashyam, S. V., Kumar, K. V. P. (2024)**

  Automatic Grading of Answer Sheets using Machine Learning Techniques. International Journal of Computer Application

- **Pavan, K. N., Akash, K., Nethranand, P. S., & Shruthi, K (2024)**

  Comprehensive Literature Review on Automated Text Summarization and Evaluation using NLP Approaches. Journal of Artificial Intelligence Research

- **Stoehr, J., Al-Mansoori, A., & Tinkham, D (2023)**

  Natural Language Processing for Automatic Evaluation of Free-Text Answers: A Feasibility Study Based on the European Diploma in Radiology Examination. Journal of Medical Systems

- **Khosravi, H., & Nazari, R. (2023)**

  A Survey on Machine Learning Techniques for Automated Grading Systems. International Journal doi

THANK YOU!