Driver Accident Prevention System Using Face Detection and Drowsiness Monitoring

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Abstract

Road accidents often occur when drivers feel sleepy or lose attention while driving. This project presents a simple driver accident prevention system using face detection and drowsiness monitoring. A camera continuously watches the driver's face and checks eye movements. If the driver's eyes remain closed for a long time, the system understands that the driver is feeling sleepy. Vehicle slow down and then alarm is then activated to alert the driver. This helps the driver to wake up and drive safely. The system uses basic artificial intelligence and computer vision techniques to improve road safety. The project shows how simple technology can be used to save lives and reduce accidents caused by drowsiness.

Keywords: Driver Safety, Drowsiness Detection, Face Detection, Computer Vision, AI

Introduction

Road safety is very important in today's world. Many accidents happen because drivers feel tired or sleepy, especially during night driving or long journeys. Humans may not always realize when they are falling asleep. Technology can help by watching the driver and giving an alert at the right time. This project focuses on detecting driver drowsiness using face and eye detection.

Problem Statement

Driver drowsiness is one of the main causes of road accidents. When drivers close their eyes for a long time, they may lose control of the vehicle. There is a need for an automatic system that can detect sleepiness and warn the driver before an accident happens.

Concept and Idea

The human face shows signs of sleepiness such as slow blinking and long eye closure. By using a camera and simple AI methods, the system can detect the driver's face and eyes. If the eyes stay closed longer than normal, the system understands that the driver is sleepy and gives an alert sound and slow down the vehicle.

System Architecture and Materials Used

A. Hardware Components

- Camera (Webcam)
- Buzzer / Alarm
- Laptop or Raspberry Pi
- Power Supply

B. Software Tools

- Python Programming Language
- OpenCV Library
- Facial Landmark Detector

C. Platform

- Windows Operating System
- Block coding

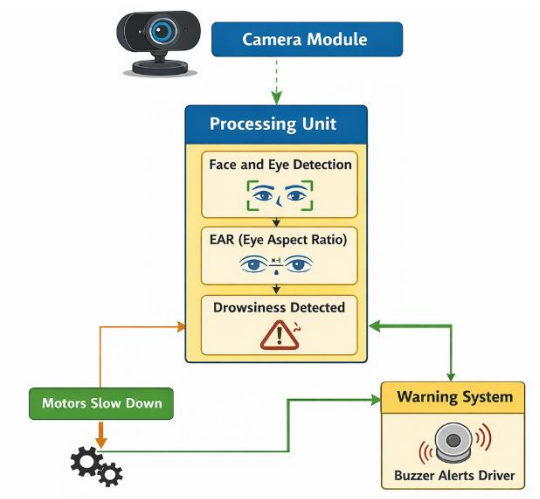

Fig. 1. System Architecture

Working Principle

1. The camera captures live video of the driver.
2. The system detects the driver's face from the video.
3. Eye positions are identified using facial landmarks.
4. Eye Aspect Ratio (EAR) is calculated.
5. If the EAR value is low for a long time, drowsiness is detected.
6. Vehicle slow down and alarm sounds to wake the driver.

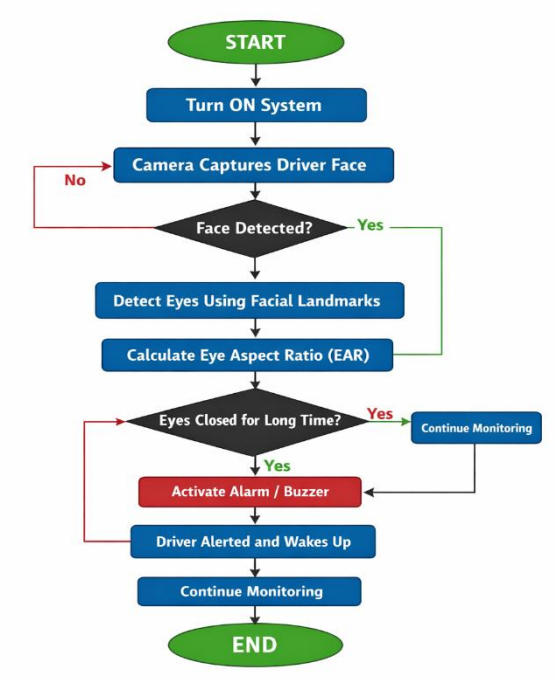

Fig. 2. working principle

Code Explanation (Simple Level)

The program is written in Python using OpenCV and Dlib.

- **Camera Code:**
  Opens the webcam and reads video frames.
- **Face Detection Code:**
  Finds the driver's face in each frame.

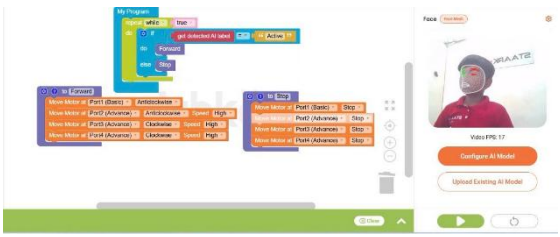

Fig. 3. Facemask detection screen shot

- **Eye Detection Code:**
  Locates the eyes using facial landmark points.
- **Eye Aspect Ratio (EAR):**
  EAR checks whether eyes are open or closed.
    - High EAR → Eyes open
    - Low EAR → Eyes closed
- **Alert Code:**
  If eyes stay closed for many frames, a vehicle motors slow down and buzzer or alarm is turned ON.

This code works continuously in a loop to ensure real-time monitoring.

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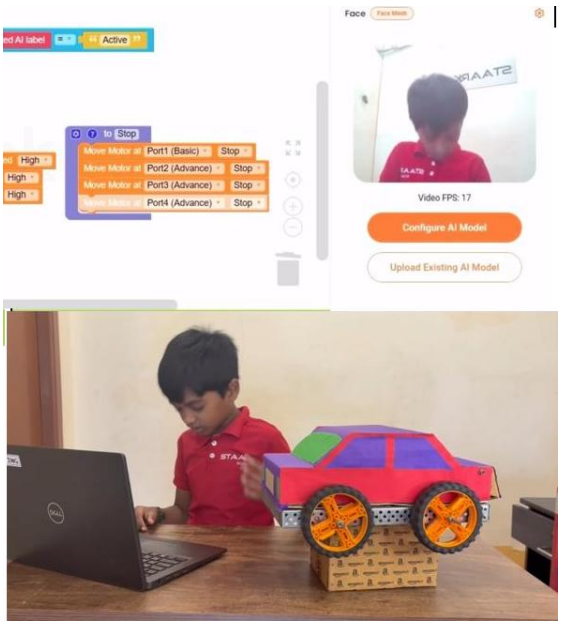

Fig. 4. Facemask detection & Prototype

Results and Learning Outcomes

A. Results

- Accurate detection of face and eyes
- Quick alert during drowsiness
- Real-time working system

B. Learning Outcomes

- Basics of Artificial Intelligence
- Computer Vision concepts
- Python programming
- Importance of road safety

Conclusion and Future Improvements

The driver accident prevention system successfully detects drowsiness using face detection. It helps prevent accidents by alerting the driver early. In the future, this system can be improved by:

- Adding mobile alerts
- Using infrared cameras for night driving

- Connecting to vehicle braking systems
- Detecting distraction and emotions

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