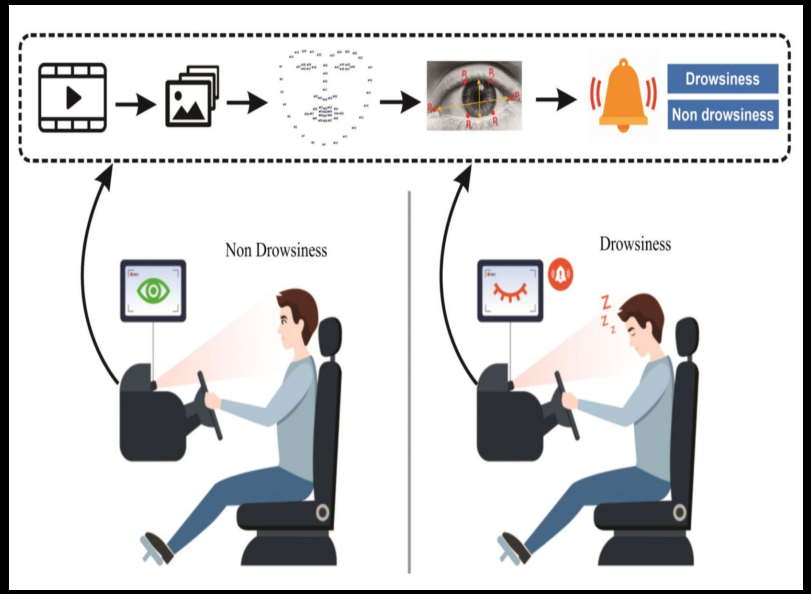
"Drowsy Guard”
Keeping Eyes on the Road



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Statistical Analysis

- Bus accidents surged by 66.82%, in February 2023 compared to the same period in 2022.Fatalities in private bus accidents rose by 47.76%, while government bus accidents resulted in a 3.05% increase in deaths during the same period.

- Earlier in October 2022, a sleeper coach bus operated by a private tourist entity, collided with a truck carrying coal. The bus caught fire and 12 passengers were killed. The probe indicated that the driver had dozed off at the wheel.

Source : National Safety Council (NSC), Transport department

Problem

Driving accidents due to driver drowsiness and unforeseen health emergencies, such as heart attacks, are significant contributors to road fatalities and injuries globally. The objective of this project is to mitigate these risks and enhance road safety by developing an intelligent system that can effectively detect drowsiness and predict potential heart attacks in drivers using facial recognition and deep learning techniques.

Solution

A Raspberry pi device attached to the dashboard of the vehicle consists of camera, alarm system, motion sensors.

It takes the photo of the driver in real time and sends it to (CNN) deep neural network can be used to identify signs of driver drowsiness and heart attack at the edge by analyzing images of the driver's face captured by a camera.

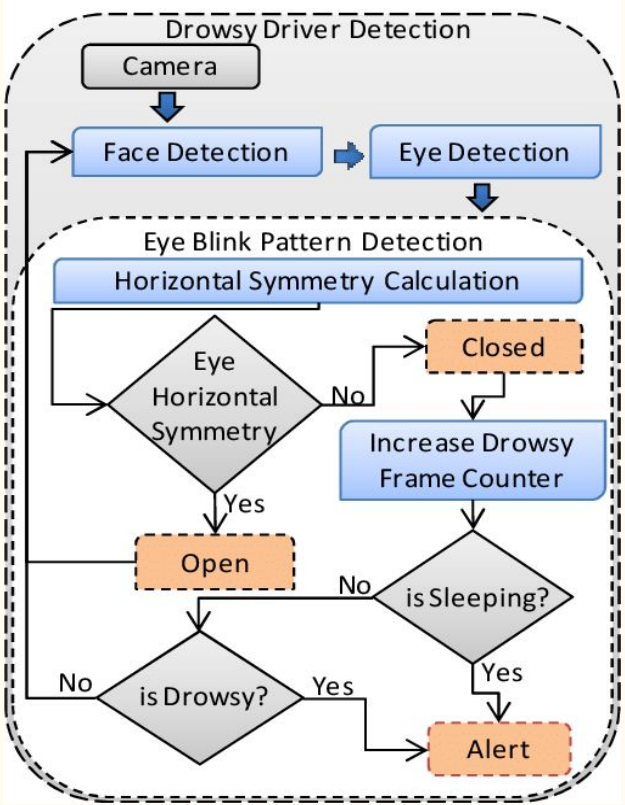
For drowsiness detection, the system analyzes changes in the driver's eye movement and blinking patterns. If the system detects that the driver's eyes are closed for an extended period, it sounds an alarm to alert the driver.

For heart attack detection, the system analyzes changes in the driver's skin color and temperature. If the system detects abnormal readings, it automatically calls for emergency medical assistance.

Working

Components required

1. Raspberry pi / Edge computing device
2. Minimum 4GB RAM & 64GB Secondary storage
3. Raspberry Pi Camera Module V2
4. GPS sensor
5. Audio output
6. Wifi module

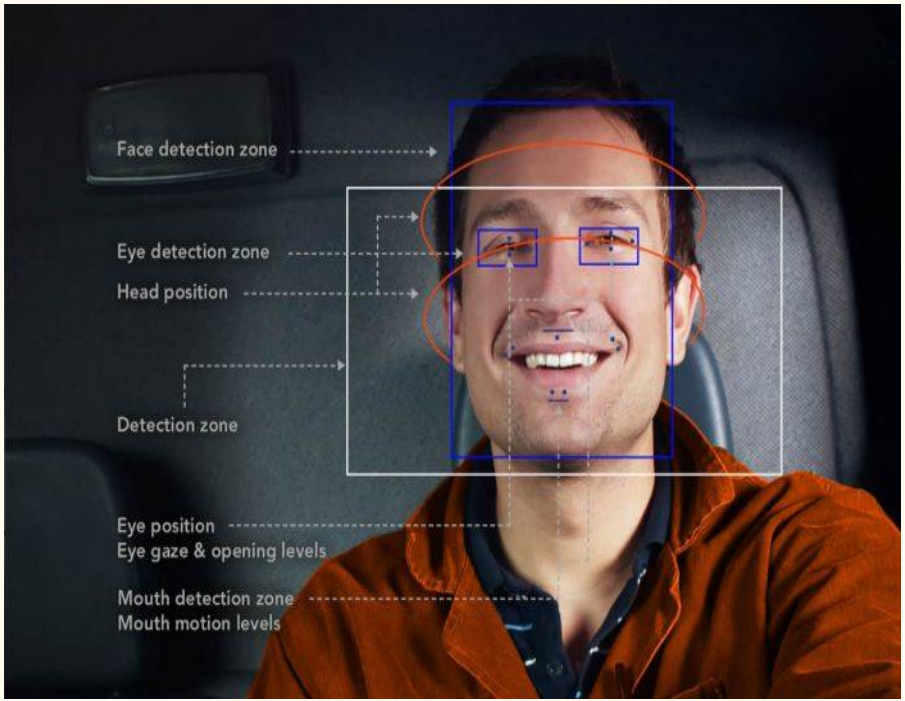


Implementation of Artificial Intelligence

Image Capture: The system utilizes an onboard camera to continuously capture images of the driver's face while they are driving.

Real-time Image Analysis: These captured images are processed in real-time using Convolutional Neural Networks (CNNs), a deep learning technique specialized for image recognition.

Facial Expression Detection: The CNN analyzes facial expressions of the driver, including the movement of facial muscles and features such as the mouth and eyebrows to identify signs of drowsiness or fatigue.



Key Components in Analysis

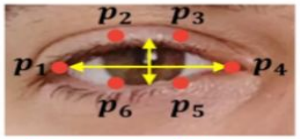
Eye aspect ratio (EAR): The EAR is the ratio of the width of the eye to the height of the eye. A lower EAR indicates that the eye is more closed, which is a sign of drowsiness.

Pupil diameter: The pupil diameter can also be used to detect drowsiness. A smaller pupil diameter is a sign of drowsiness.

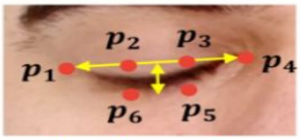
Periorbital muscle activity: The periorbital muscles are the muscles that surround the eyes. Increased activity in these muscles is a sign of drowsiness.

Head pose: The head pose can also be used to detect drowsiness. For example, a tilted head is a sign of drowsiness.

$$EAR = \frac{\|p_2 - p_6\| + \|p_3 - p_5\|}{2\|p_1 - p_4\|}$$



Open eye will have more EAR



Closed eye will have less EAR

Stats from KYA Session

160 Deaths due to accidents out of which 90 deaths from two wheelers.

From the 90 deaths, 80 head injuries / Fatal accidents.

Cause of 80 Fatal deaths - Not wearing helmets.

Improvised Machine Learning model for Bikes.

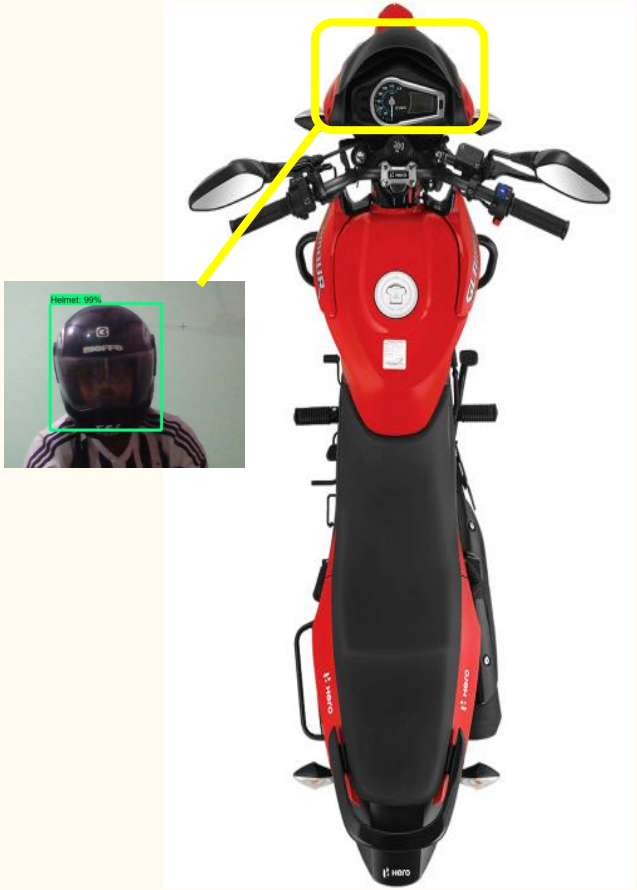
Drowsy Garud in Bikes

Ability to detect whether the person is wearing helmet or not.

If the driver doesn't wear helmet, an alarm will be triggered, until the person wears the helmet.

It is so efficient that just with a software update we can implement the Machine learning model in the drowsy guard device.

No extra hardware components required.
Highly FEASIBLE and Makes a HUGE impact.



Features

Driver Acknowledgment: To ensure the driver acknowledges the alert, the system may require the driver to respond within a certain timeframe (e.g., pressing a button or touching the screen). If no response is received, the system can escalate the alert.

Bus Depot Notification: In the event of drowsiness detection in a public transport vehicle, the system will automatically send notifications to the local bus depot or transportation control center. This notification will include essential information such as the vehicle's identification, location, and the detected drowsiness status of the driver. The bus depot can then take appropriate actions, such as dispatching a relief driver or providing guidance to the current driver, to ensure passenger safety and the continuous operation of the public transport service.

Emergency Medical Assistance: While the primary focus is on drowsiness detection, the system can also monitor the driver's vital signs, such as skin color and temperature. In case of heart attack analysis, An alert will also be send to the general ambulance service.

Feasibility & Impact

- All the necessary components are readily available in the market, making the implementation of our solution technically feasible. Moreover, there is an abundance of open-source libraries and frameworks available for machine learning and image processing, which can significantly reduce the development time and costs.

- By detecting drowsiness and alerting drivers before an accident occurs, we can prevent these injuries and potentially save lives. Implementing this solution in public road transport has benefits. It can significantly reduce the number of accidents caused by driver drowsiness and heart attacks, making roads safer for everyone.

- It not just saves one person, but all the passengers who are travelling in same transport vehicle. Making it a valuable and impactful initiative in the domain of road safety and driver health.

Thankyou