SLEEPY DRIVER

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Drowsiness/Yawn Detection System

This is a a Computer Vision(openCV) based project which utilizes the Kivy Library to create a user friendly GUI which can easily be compiled into an apk file and run on the android operating system.

Problem

- 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.
- Some of the current systems learn driver patterns and can detect when a driver is becoming drowsy.

Domain Of The Project

- **COMPUTER VISION**
- ***Opencv***
- To create the main body of the project.

- **APP/GUI DEVELOPMENT**
- ***Kivy***
- To create a user friendly GUI for the project.

Approach

Driver eye/face monitoring

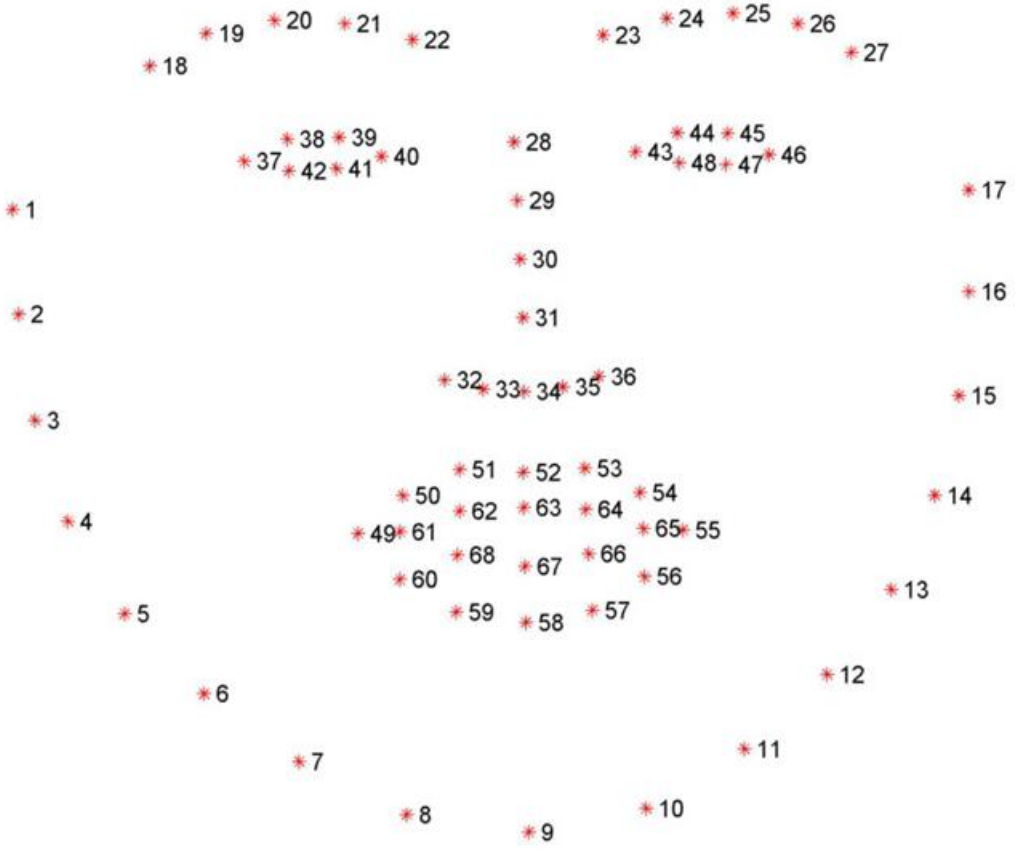
- Uses computer vision to observe the driver's face, either using a built-in camera or on mobile devices.
- Our drowsiness/yawn detector hinges on two important computervision techniques

➔Facial Landmark Detection

➔Eye Aspect Ratio / Lip Distance

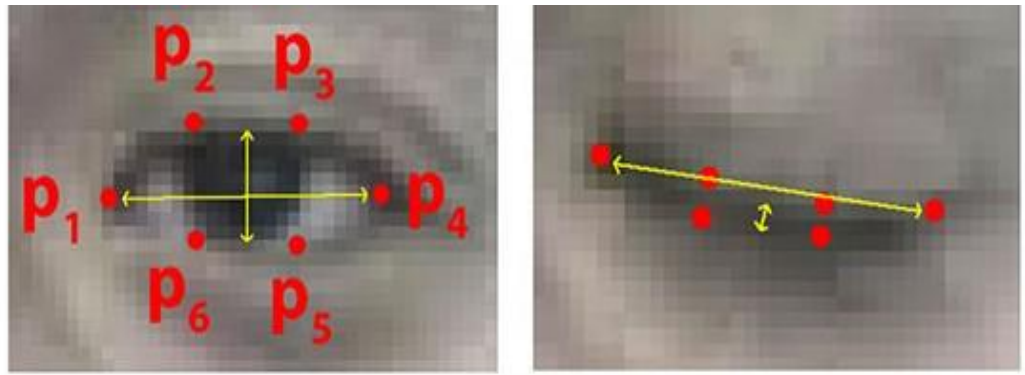
Facial Landmark Detection

- Facial landmark prediction is the process of localizing key facial structures on a face, including the eyes, eyebrows, nose, mouth, and jawline.
- Specifically, in the context of drowsiness detection, we only needed the eye regions and the lip region



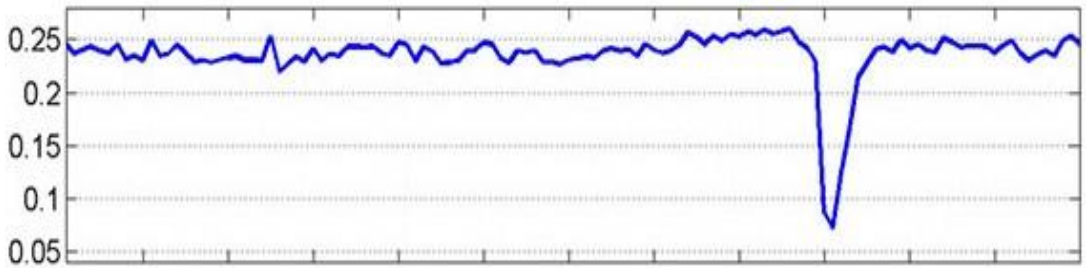
Eye Aspect Ratio

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



- We can apply the eye aspect ratio to determine if the eyes are closed.

- If the eyes have been closed for a sufficiently long enough period of time, we can assume the user is at risk of falling asleep and sound an alarm to grab their attention.



The Drowsiness Detector Algorithm

- First, we'll setup a camera that monitors a stream for faces.
- If a face is found, we apply facial landmark detection and extract the eye and the lip regions.
- Now that we have the eye regions, we can compute the eye aspect ratio to determine if the eyes are closed.
- Also, we will compute the distance between inner lips to determine if the person is yawning.
- If the eye aspect ratio indicates that the eyes have been closed for a sufficiently long enough amount of time, we'll sound an alarm to wake up the driver
- If the lip distance indicates that the person is yawning we'll sound an alarm to take some fresh air.

Graphical User Interface(GUI)

- We have created a GUI for our project to make the program user friendly and also so that it can be run on a android phone.
- The GUI has 3 buttons:

➔DETECT: To simply start detecting driver's face and check if he is drowsy.

➔TROUBLESHOOT THRESHOLDS: User can alter the EAR and Lip Distance thresholds using the toggle window provided.

➔EXIT: To end the program without running it.