Drowsiness Detection System

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Introduction To Drowsiness Detection System

Detection of drowsiness of driver is a vehicle safety technology, which helps to put off accidents which caused by the driver being dozy. A variety of studies have recommended that around 20% of all road accidents are due to drowsiness of the driver.

Facial landmarks detection is used with help of image processing of images of the face captured using the camera or webcam, for detection of distraction or drowsiness. This whole system is deployed on portable hardware which can be easily installed in the car for use.

What computer vision techniques are implemented?

Our drowsiness detector is based on two important computer vision techniques:

- Facial landmark detection
- Eye aspect ratio

Facial landmark detection 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.

Once we have our eye regions, 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.

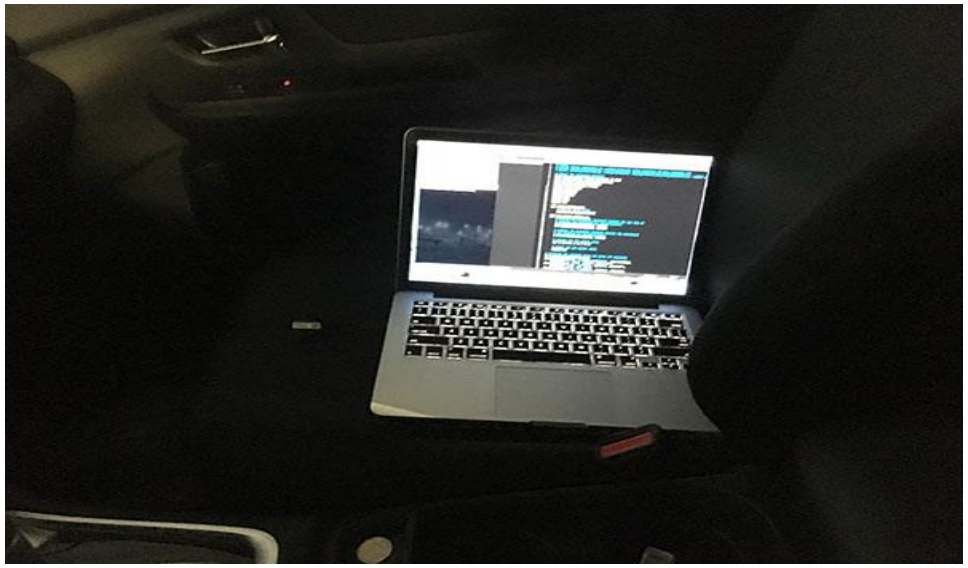
What computer languages are used?

We implemented our own drowsiness detector using OpenCV, dlib, and Python.

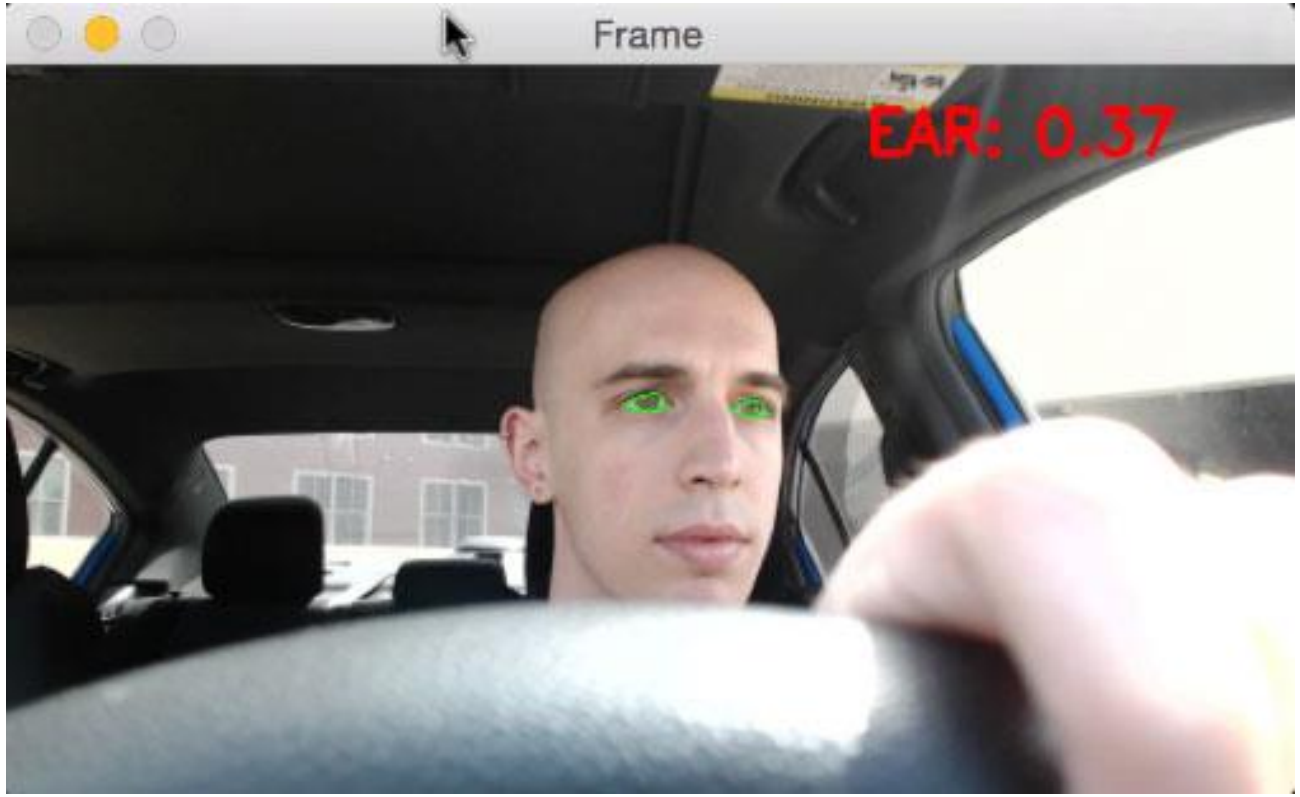
- **OpenCV**- (*Open Source Computer Vision Library*) is a library of programming functions mainly aimed at real-time computer vision.
- **Dlib** - is a modern C++ toolkit containing machine learning algorithms and tools for creating complex software in C++ to solve real world problems.
- **Python**-is a general-purpose interpreted, interactive, object-oriented, and high-level programming language.

How the Drowsiness Detection system will work?

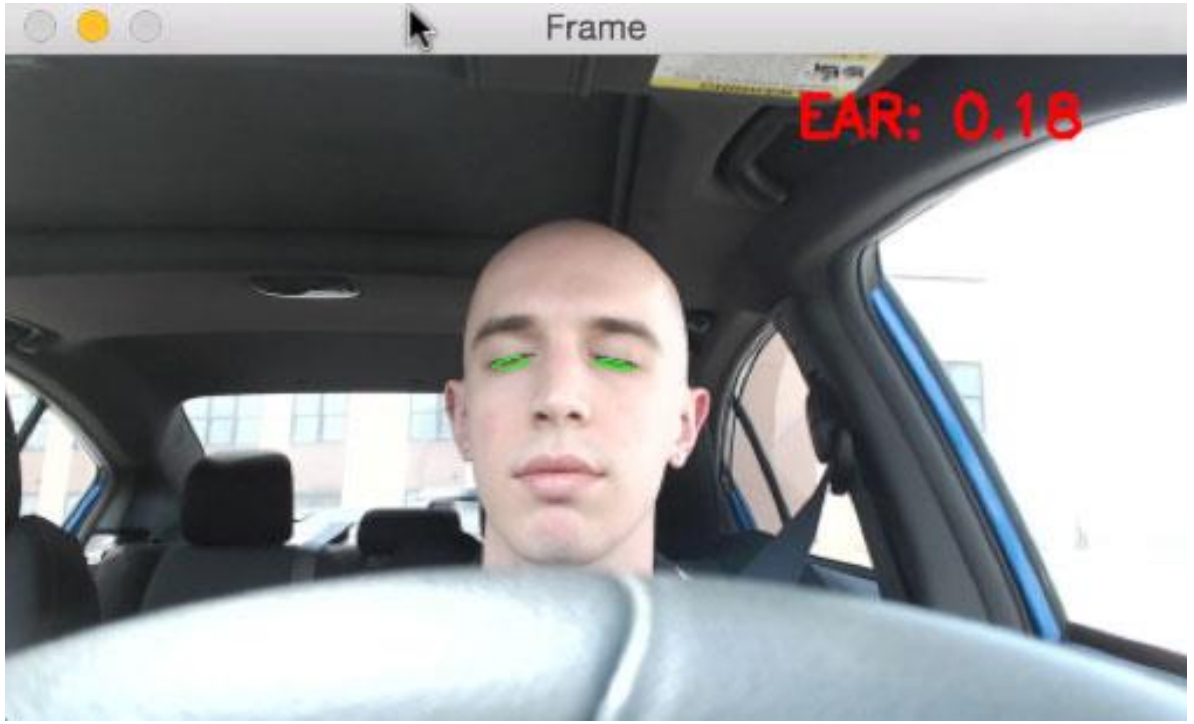
First, we'll setup
a camera
that monitors a
stream for faces



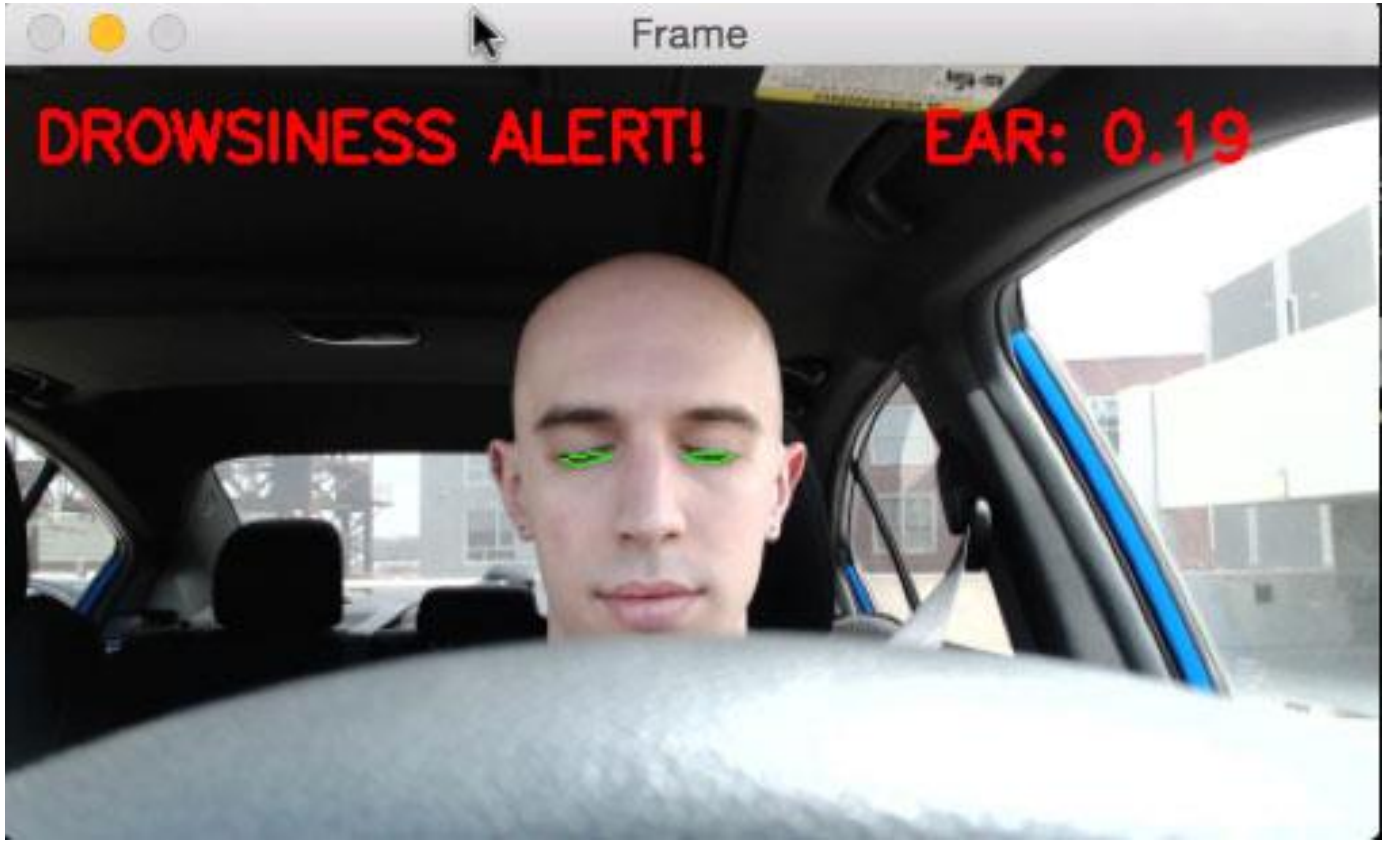
If a face is found, we apply facial landmark detection and extract the eye regions



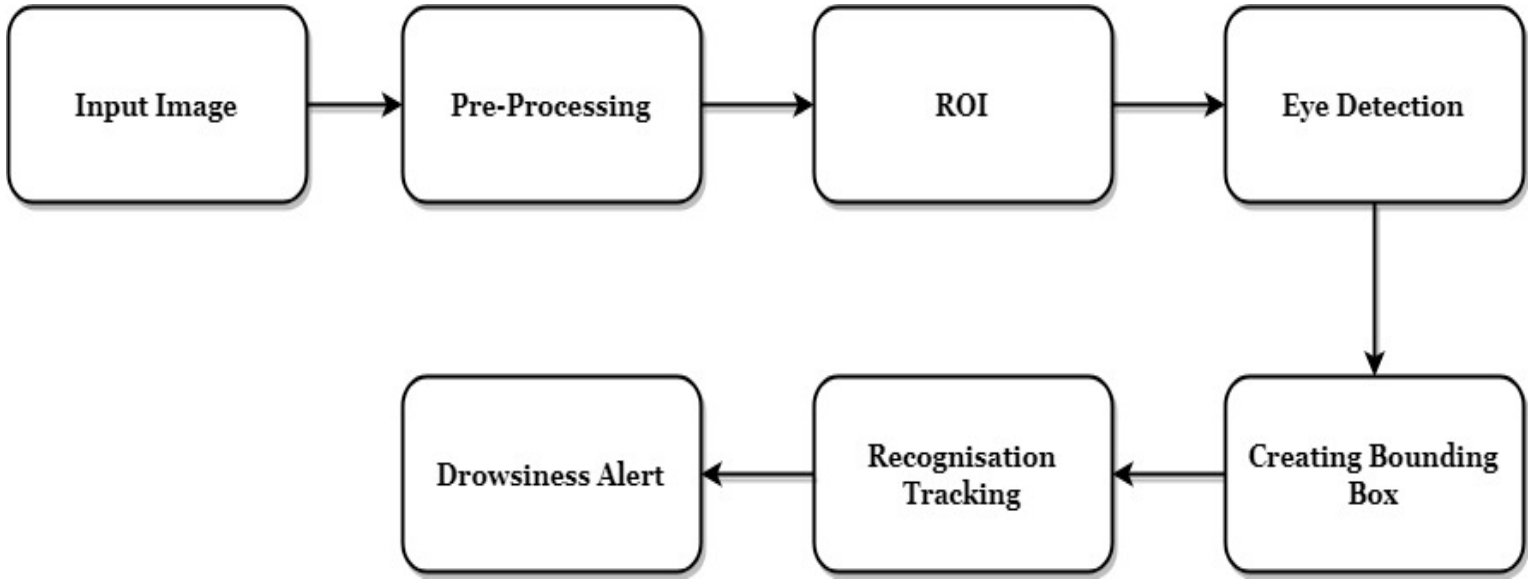
Now that we have the eye regions, we can
compute the eye aspect
ratio to determine if the
eyes are closed



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



Basic Block Diagram-



The Model Architecture

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Convolutional Neural Network

The model we will going to use is to built with Keras using **Convolutional Neural Networks (CNN)**. A convolutional neural network is a special type of deep neural network which performs extremely well for image classification purposes. A CNN basically consists of an input layer, an output layer and a hidden layer which can have multiple numbers of layers. A convolution operation is performed on these layers using a filter that performs 2D matrix multiplication on the layer and filter.

- The CNN model architecture consists of the following layers:
- Convolutional layer; 32 nodes, kernel size 3
- Convolutional layer; 32 nodes, kernel size 3
- Convolutional layer; 64 nodes, kernel size 3
- Fully connected layer; 128 nodes

Steps to run Drowsiness Detection System

- We are going to make a folder named “Drowsiness detection” that contain :
- The “haar cascade files” folder consists of the xml files that are needed to detect objects from the image. In our case, we are detecting the face and eyes of the person.
- The models folder contains our model file “cnnCat2.h5” which was trained on convolutional neural networks.
- We have an audio clip “alarm.wav” which is played when the person is feeling drowsy.
- “Model.py” file contains the program through which we built our classification model by training on our dataset.
- “Drowsiness detection.py” is the main file of our project. To start the detection procedure, we have to run this file.

Carbon Dioxide Detection:

As a result of a previous survey, it was found that the occurrence of many drowsy driving operations depend on the air quality in vehicles. Therefore, this method tried to prevent drowsy driving by detecting the concentration of carbon dioxide in vehicles. represents a sensor for measuring the concentration of carbon dioxide of the NDIR(Non-Dispersive Infrared) system. If the concentration of carbon dioxide was over 1500 ppm, it was expected that drowsiness would appear. Further, when the concentration of carbon dioxide was high, this not only caused drowsiness and stiffness but also caused dizziness, headache and health problems. This sensor measures the concentration of carbon dioxide to the extent that refraction is caused by gas concentration using a non-distributed infrared emitting unit. The sensor has high durability and high accuracy, thereby detecting drowsy driving quickly.

Merit of Proposed system

The main aim of our project is to develop non-intrusive system which
will detect the fatigue or drowsiness of driver and will issue a warning with the help of alarm. As most of the accidents are caused due to drowsiness so this project will help to decrease the crashes or accidents.