Driver Drowsiness Detection

INTRODUCTION

Drivers often feel very drowsy while continuously driving for long distances without taking breaks. Drowsiness is a major factor in increasing the chances for a vehicle to meet accidents. The number of accidents caused by drowsiness can be reduced by having a proper system that can detect drowsiness, alert the driver and prevent major injuries. It needs a proper system that will alert drivers to prevent major injuries. The project starts an alarm when it detects the driver is drowsy and notify drivers to take a rest.

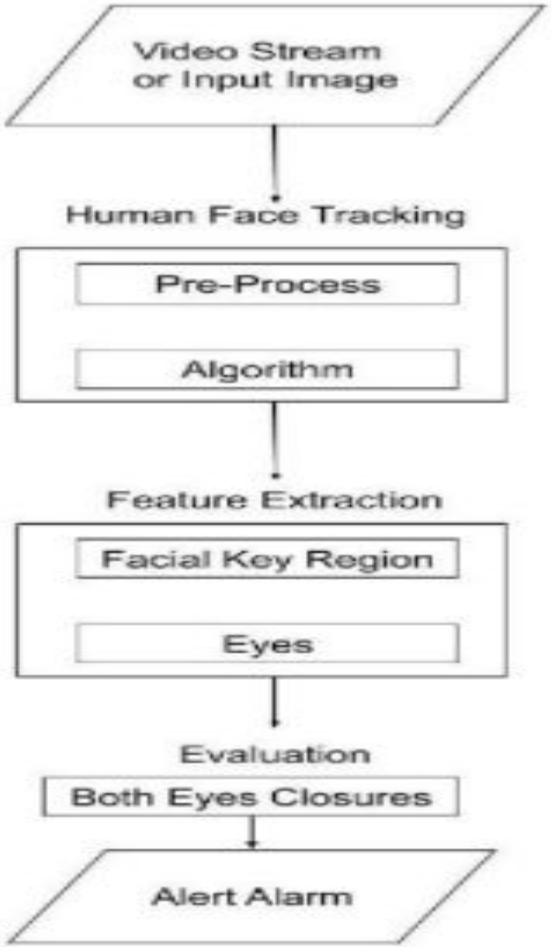
These techniques are Image Processing, convolutional neural network. And image processing based techniques can be divided in three categories. These categories are template matching technique, eye blinking technique, yawning based technique. In the computer vision technique, facial expressions of the driver like eyes blinking and head movements are generally used to detect driver drowsiness.

DATASET AND MODEL ARCHITECTURE

The data comprises around 7000 images of people's eyes under different lighting conditions. Now, we can use this model to classify if a person's eye is open or closed.

The model we used is 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.

BLOCK DIAGRAM



ALGORITHM

Step 1 – Take an image as input from a web-camera.

To access the webcam, we made an infinite loop that will capture each frame. We use the method provided by OpenCV, cv2.VideoCapture(0) to access the camera and set the capture object (cap). cap.read() will read each frame and we store the image in a frame variable.

Step 2 – Detect the face in the image and create a Region of Interest (ROI).

To detect the face in the image, we need to first convert the image into grayscale as the OpenCV algorithm for object detection takes gray images in the input. We don't need color information to detect the objects. We will be using a haar cascade classifier to detect faces.

Step 3 – Detect the eyes from ROI and feed it to the classifier.

The same procedure to detect faces is used to detect eyes. First, we set the cascade classifier for eyes in leye and reye respectively then detect the eyes.Now we need to extract only the eyes data from the full image. This can be achieved by extracting the boundary box of the eye and then we can pull out the eye image from the frame

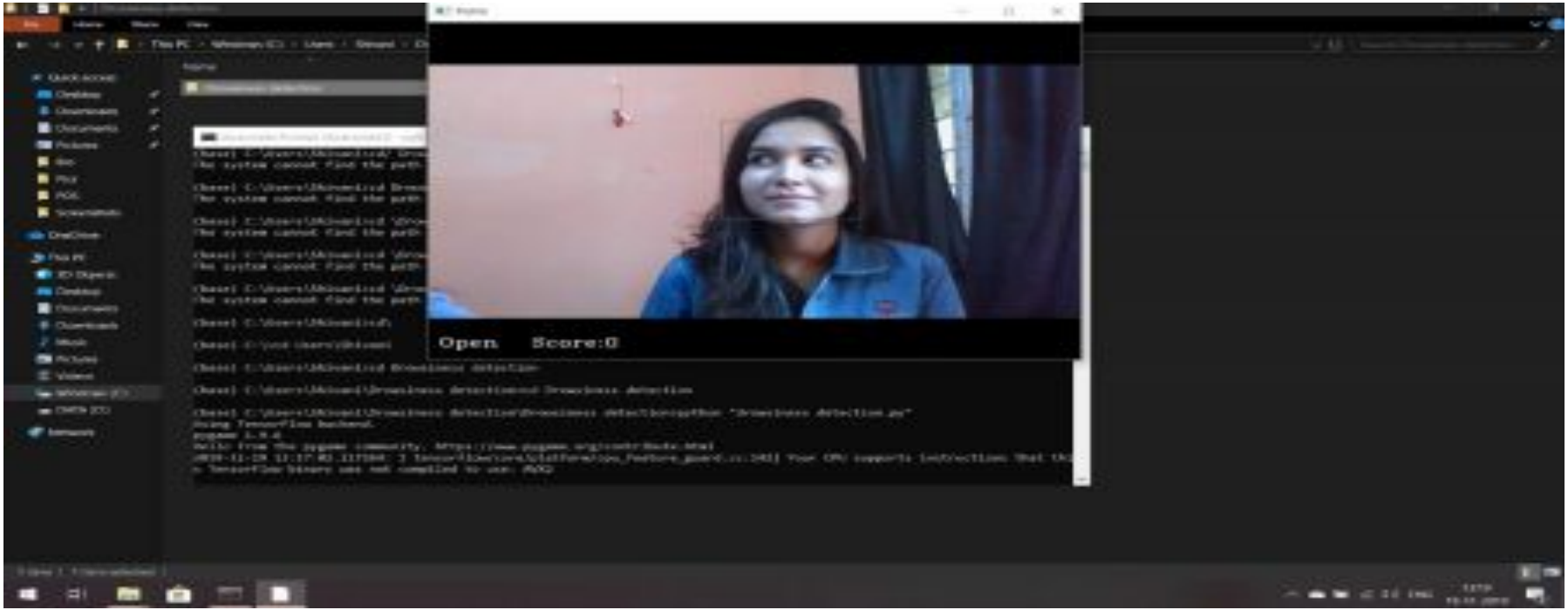
Step 4 – The classifier will categorize whether eyes are open or closed.

We are using CNN classifiers for predicting eye status. To feed our image into the model, we need to perform certain operations because the model needs the correct dimensions to start with. First, we convert the color image into grayscale.

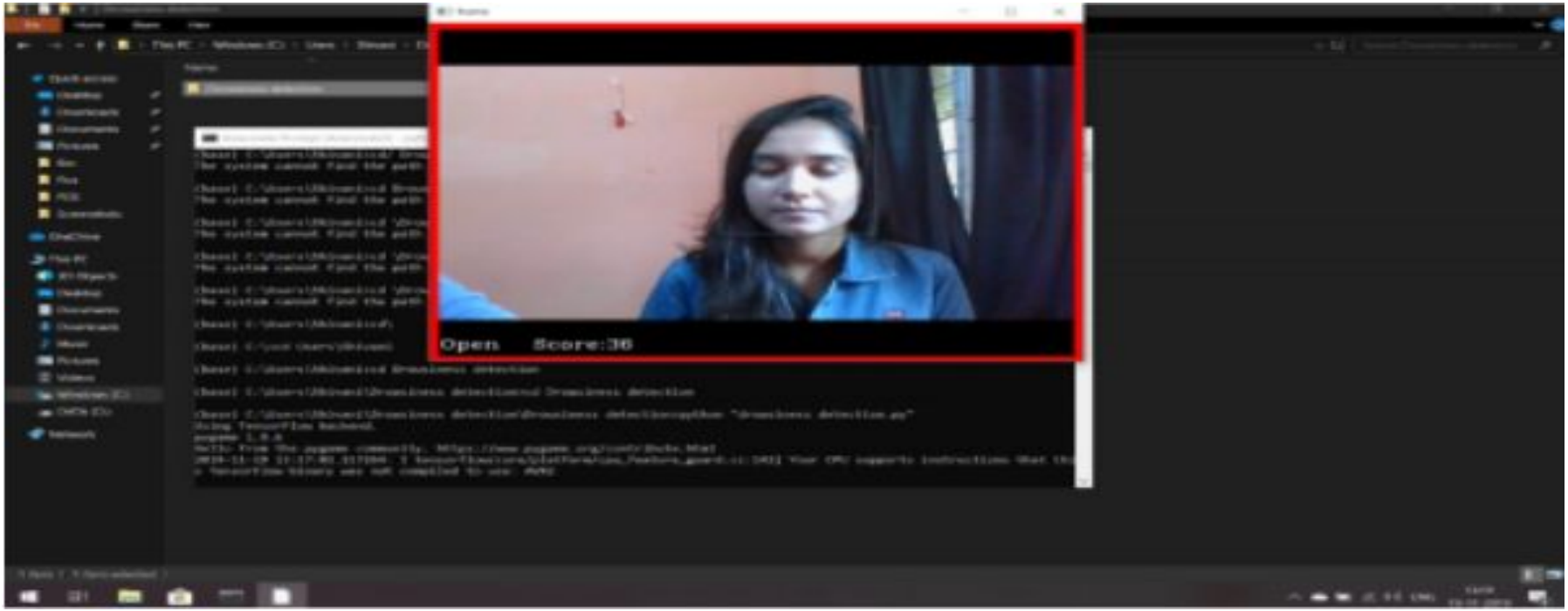
Step 5 – Calculate score to check whether the person is drowsy.

The score is basically a value we will use to determine how long the person has closed his eyes. So if both eyes are closed, we will keep on increasing the score and when eyes are open, we decrease the score. We are drawing the result on the screen using the cv2.putText() function which will display the real-time status of the person.

Result (when awake)



When driver is drowsy



Conclusion

The Accident Reduction Aid system developed is capable of detecting drowsiness in a rapid manner. The system which can differentiate normal eye blink and drowsiness which can prevent the driver from entering the state of sleepiness while driving. The system works well even in case of drivers wearing spectacles and under low light conditions also. During the monitoring, the system is able to decide if the eyes are opened or closed. When the eyes have been closed for about two seconds, the alarm beeps to alert the driver. By doing this many accidents will be reduced and provides safe life to the driver and vehicle safety.