Driver Drowsiness Detection

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Abstract

Through this article we intend to present a method for detecting and hence curbing drowsiness amongst drivers. The paper presents an approach using a simple camera sensor to effectively predict whether or not the driver is feeling drowsy. This method will work in real time and can help in eliminating a major factor for road accidents on highways.

1 Motivation

It has been extensively accepted that driver drowsiness is a significant factor in the increasing number of accidents on today's roads. This has been verified by many researchers that have demonstrated ties between driver drowsiness and road accidents. Although it is hard to decide the exact number of accidents due to drowsiness, it is much likely to be underestimated. This shows the significance of a research with the objective of reducing the dangers of accidents anticipated to drowsiness.

The automobile business also has tried to build several systems to predict driver drowsiness but there are only a few commercial products available today. These systems do not look at driver performance and overlook driver ability and characteristics.

2 Hypothesis/Problem statement

The proposed work is to alert the driver when he is drowsy or distracted away from his normal alert mode by means of buzzer or mechanical vibrations.

In this project real time data is collected by video camera and other micro electro-mechanical system devices. This data gives information about driving condition of driver which acts as input to controller. The appropriate measures are taken by controller to alert the driver.

3 Method

Face landmark detection is the process of finding points of interest in an image of a human face. OpenCV describes a predefined model for this purpose. Face landmark detection will help in finding the coordinates of the drivers eye. Using these coordinates we can calculate the aspect ratio of the shape of the eyes.

The eye aspect ratio indicates whether the eyes are closed or not. If the aspect ratio goes below a certain threshold we can conclude that the eyes are closed. So as to not equate blinking to drowsiness we will sound the alarm only after 1 or 2 seconds of the eyes being closed.

We are going to extend this method and use it to determine how long a given person's eyes have been closed for. If their eyes have been closed for a certain amount of time, we'll assume that they are starting to doze off and play an alarm to wake them up and grab their attention.

4 Expected result

The return value of the eye aspect ratio will be approximately constant when the eye is open. The value will then rapid decrease towards zero during a blink. If the eye is closed, the eye aspect ratio will again remain approximately constant, but will be much smaller than the ratio when the eye is open.

In our drowsiness detector case, we'll be monitoring the eye aspect ratio to see if the value falls but does not increase again, thus implying that the person has closed their eyes.

5 Summary

Through this synopsis we have presented an idea on building a drowsiness detector using OpenCV, dlib, and Python.

Our drowsiness detector hinged on an important computer vision techniques, which is 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.

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.