JSPM's
Rajarshi Shahu College of Engineering,
Tathawade, Pune – 33

DEPARTMENT OF ELECTRONICS AND TELECOMMUNICATIONS

S.Y. B.Tech
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Engineering Design and Innovation (EDI)
PROJECT REPORT

Division **:** B(B2)

Name of Students **:**

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Title of the Project **: Driver Drowsiness Eye Detection System**

Name of Facilitator **: Dr. P.M. Ghate sir**

1. Need Statement:

The term"drowsy" indicates "sleepy," as in prone to falling asleep. Drowsiness is commonly induced by a lack of sleep, certain medications, and boredom produced by driving a vehicle for extended periods of time. The driver will lose control of his vehicle when sleepy, resulting in an accident.

Many efforts have been made to reduce all these numbers such as developments in computers that can be used to track drivers' conditions with the ability of alerting in dangerous situations.Using physiological measures, ocular measures and performance measures, a variety of methods have been investigated and applied to describe driver drowsiness and distraction.

2. Problem Statement:

The need of public transportation is growing at a rapid rate which has increased road accident statistics. There are number of safety devices used in vehicles to protect the driver like seat belts, air bags, speed brake, etc.

These devices always act after the accident has happened. There is lot of research happened to estimate driver fatigue and alert the driver to prevent accidents on road.

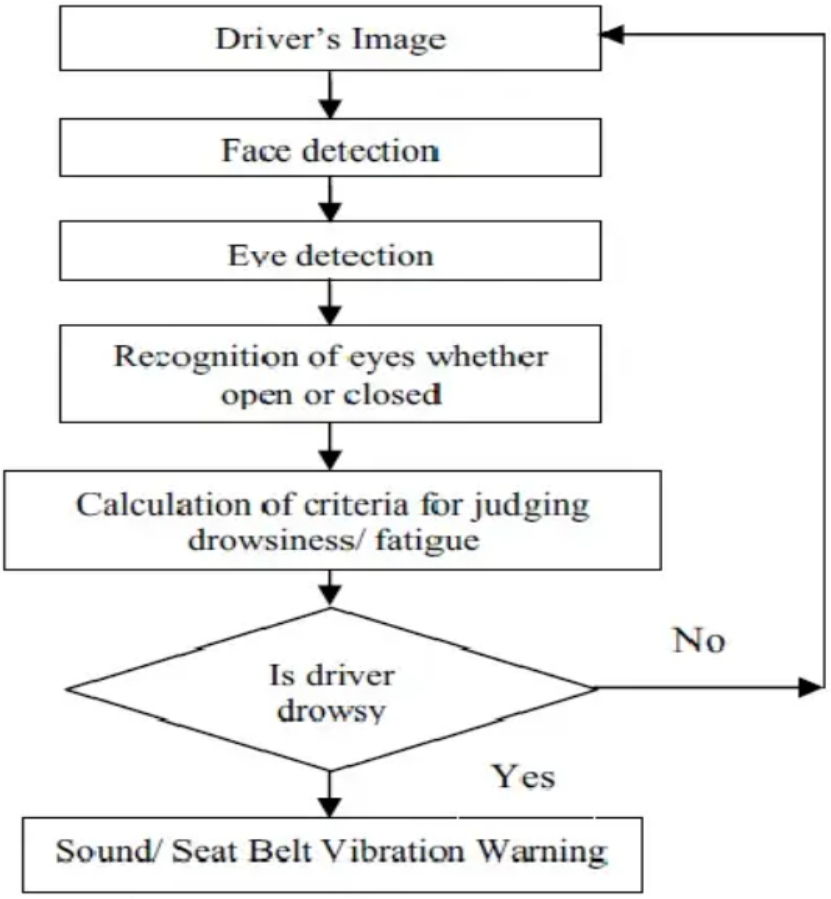
3. Literature Review:

There are many previous researches regarding driver drowsiness detection system that can be used as a reference to develop a real-time system on detecting drowsiness for drivers. Technological approaches for detecting and monitoring ocular and facial characteristics continue to emerge and many are now in the development, validation testing, or early implementation stages.

There is also several method which use different approaches to detect the drowsiness signs :

1. Drowsiness and Fatigue
2. Electroencephalography (EEG) for Drowsiness Detection
3. Drowsiness detection using face detection system
4. PERCLOS (Percentage of Eye Closure)

4. Block Diagram:



5. Software Required:

a. Python Compiler
b. Microsoft Visual Studio
c. Libraries required for execution :
   - Opencv ,dilib and Numpy
   - Imutiles, Pygame, Mixer ,Face_utiles and CV2

6. Mechanism:

Step 1:
So we'll install all our dependencies in this step. We're going to use OpenCV for computer vision, Dlib library for facial recognition, and also the Imutils package to use some functions that will help us convert the landmarks to NumPy array and make it easy for us to use

Step 2:
Initialize and read from the webcam

Step 3:
Facial Landmark Detection using dilib Facial landmarks are the key attributes of a face in an image like eyes, eyebrows, nose, mouth, and Jaw.

Now the question arises, how are we going to use these landmarks for eye detection.

Eye Landmarks:

We saw that we can extract any facial structure from the 68 Facial Landmarks that we detected. So, we'll extract the landmarks of the eyes i.e 6 (x,y) coordinates for each eye, for any given face in an image. And then we'll calculate the EAR for these landmarks.

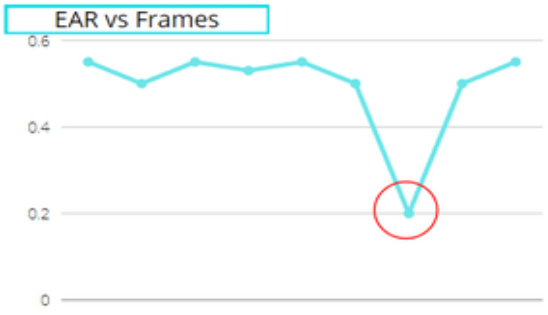
Eye Aspect Ratio (EAR) :

This method is very simple, efficient, and doesn't require anything like image processing. Basically, this ratio gives us a certain relation between the horizontal and vertical measurements of the eye. This is the equation to calculate the EAR using the six parameters of the eye :

Eye Aspect Ratio

$$EAR = \frac{\text{Sum of Verticle distnace}}{\text{2*Horizontal Distance of Eye}}$$

This is the most important part, when you calculate the EAR of an eye, it remains constant when the eye is open but it suddenly drops when the eye is blinked. Below, I have shown a graph to show it's working:



As you can see in the image the overall value of EAR was constant throughout except at one point i.e when the eye is blinked, making it one of the most simple and most efficient ways of detecting an eye blink.

Since we have two EAR for each eye respectively we'll take the average of both the EAR for the right eye and the EAR for the left eye and then check if it is lower than a certain threshold (we'll create a variable to set its value) and this threshold might vary a bit, for me it worked with 0.25 but in some cases, it works with 0.4 or 0.3 as well. It depends on the FPS of your video or webcam.

Next : We'll keep the count of the frames when the EAR is lower than the threshold and if the count is 3 (or 5 depending on the fps) frames then we'll consider a blink detected.

7. Project Photo/Result:

Here we come up with two conditions:

- When there is not much action in the eye which makes the value of EAR constant, the camera doesn't disturb the user until any

movement.

- When there is a slight change in the value of EAR while monitoring, the program alerts the user regarding change in movement.

8. Conclusion:

9. References:

- A. M. Malla, P. R. Davidson, P. J. Bones, R. Green and R. D. Jones," Automated video-based measurement of eye closure for detecting behavioral microsleep" 2010 Annual International Conference of the IEEE Engineering in Medicine and Biology, Buenos Aires, 2010. DOI: 10.1109/IEMBS.2010.5626013.

- Gopal and V. . Vineeth, "Driver Drowsiness Detection System," International Journal of Advances in Electronics and Computer Science, Vol. 4, No. 3, pp. 101–104, 2017.

- S. Podder and S. Roy, "Driver's drowsiness detection using eye status to improve the road safety," International Journal of Innovation Research in Computer and Communication Engineering, Vol. 1, No. 7, 2013.

- K. Das and R. N. Behera, “A Survey on Machine Learning: Concept, Algorithms and Applications,” International Journal of Innovative Research in Computer and Communication Engineering, Vol. 5, No. 2, pp. 1301–1309, 2017.