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# Don't Sleep – Drowsiness Detection Tool

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## ABSTRACT

***An important application for machine vision and image processing can be the driver's recovery program because of its high importance. In recent years a number of research works have been reported in the literature in this field. In this paper, in contrast to the conventional tone detection methods, which are based on eye regions alone, we have used facial expressions to detect drowsiness. There are many challenges that involve pull detection systems. Some of the important issues are: changes in stiffness due to lighting conditions, the presence of glasses and beards on a person's face. For this project, I propose and implement an infrared light-based hardware system and can be used to solve these problems. In the proposed method, following the acquisition step of the face, the most important face elements and considered to be the most effective, are extracted and tracked in the video sequence frames. The system is monitored and performed locally.***

***Keywords—*** *Don't Sleep, Drowsiness Detection Tool, Drowsiness, Road Accidents, Eye Aspect Ratio*

## 1. INTRODUCTION

Every year more and more people lose their lives because of fatal road accidents worldwide and hot driving is one of the leading causes of road accidents and deaths. Exhaustion and poor sleep in the most common driving sources are the cause of major accidents. However, the first signs of fatigue may appear before the emergence of a crisis and therefore, the diagnosis of driver fatigue and its identification is a topic of further research. Most traditional methods of getting sleep are based on behavioral behavior while some are less confusing and may distract motorists, while others require expensive sensors. So, in this paper, a light weight, driver-specific death detection system was developed and implemented in the Android app. The program records videos and recognizes the face of the driver in all sectors using image printing techniques. The system can detect facial expressions, including the Eye Aspect Ratio (EAR) to detect driver drowsiness based on a changing threshold. Machine learning algorithms were employed to test the performance of the proposed method.

*Image Source: Google*

## 2. OBJECTIVE

One of the major causes behind the casualties of people in road accidents is driver's drowsiness. After continuous driving for long time, drivers easily get tired resulting into driver fatigue and drowsiness. Research studies have stated that majority of accidents

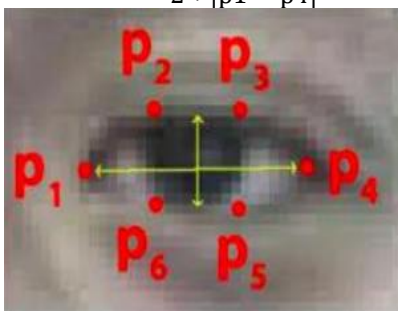
occur due to driver fatigue. Different countries have different statistics for accidents that occurred due to driver fatigue. Developing technology for detecting driver fatigue to reduce accident is the main challenge. According to the report by "Ministry of Road Transport & Highways" there were 4,552 accidents reported every year in India that took lives of thousands of people because of sleepy drivers (Road Accidents in India 2016). For instance, many vehicles are driven mostly at night such as loaded trucks. The drivers of such vehicles who drive for such continuous long period become more susceptible to these kinds of situations. Detecting drowsiness of drivers is still an ongoing research in order to reduce the number of such miss-happenings and accidents. Typical methods used to identify drowsy drivers are physiological based, vehicle based, and behavioural based.

To overcome this problem I have used python's OpenCV which determines drowsiness using EAR (Eye Aspect Ratio) using Euclidean Distance. I have named to tool as "Don't Sleep!"

Don't Sleep! Warns the driver with an alarm if he/she is falling asleep. The tool will also give a live location of the driver to the nearest PCR van after more than 3 indicators within 4(four) hours. The process goes on until the driver stops the ride. For testing the efficiency of the proposed approach, a data set of more than 50 people was collected. The logs of the results that were captured by the tool were collected and analysed with the help of machine learning classifiers.

To extract the facial landmarks of drivers, Dlib library was imported and deployed in our application. The library uses a pre-trained face detector, which is based on a modification to the histogram of oriented gradients and uses linear SVM (support vector machine) method for object detection. Actual facial landmark predictor was then initialized and facial landmarks captured by the application were used to calculate distance between points. These distances were used to compute EAR value. EAR is defined as the ratio of height and width of the eye and was computed using equation given below. The numerator denotes the height of the eye and the denominator denotes the width of the eye and the details of the all the landmarks of eye are depicted by figure given below.

$$EAR = \frac{(\,|p2 - p6| + |p3 - p5|\,)}{2 * |p1 - p4|}$$




## 3. PERFORMANCE EVALUATION WITH EXPERIMENTAL RESULTS

The performance evaluation of the proposed approach by performing an empirical analysis of obtained results are as follows- First, the system collects the real-time data of the drivers depicted by Figures A, B, C and D. It then determines drowsiness of the drivers based on the EAR values that are computed based on the images captured of the user and its response from the server.

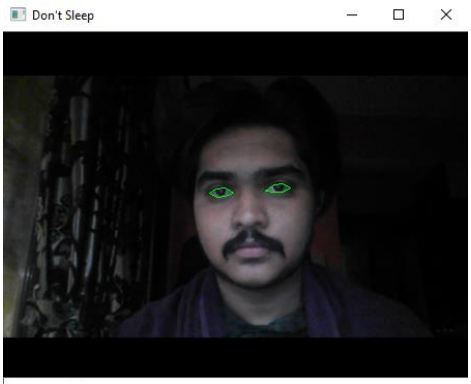



**Fig. A (Face without specs)**

The tool has not yet detected sleep/drowsiness as the EAR is normal.

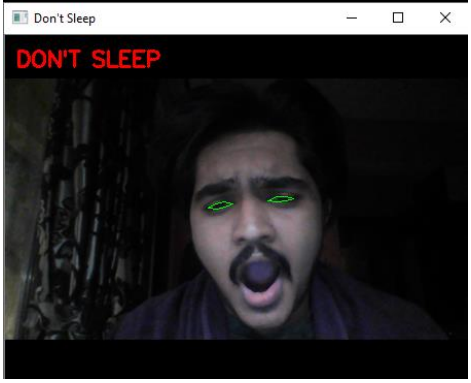



**Fig. B.1 (Face without specs)**

Alarm is screened as yawn detected with change in EAR.

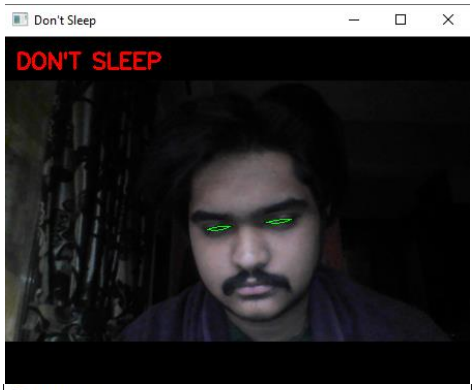



**Fig. B.2 (Face without specs)**

Alarm is screened due to change detected in EAR.

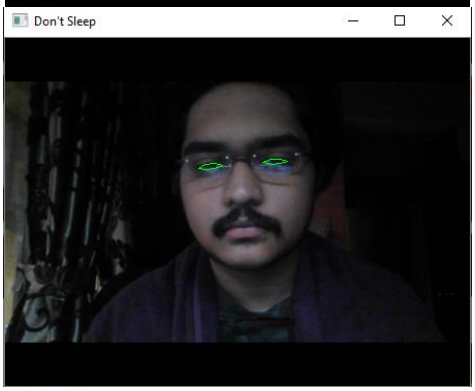



**Fig. C (Face with specs)**

The tool has not yet detected sleep/drowsiness as the EAR is normal.

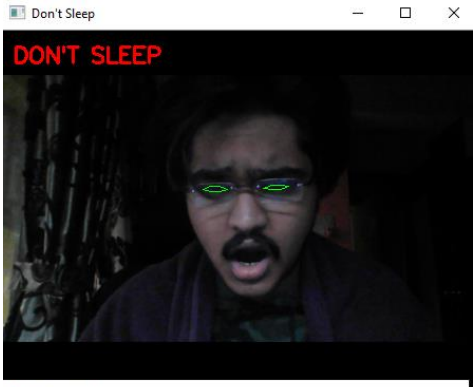



**Fig. D.1 (Face with specs)**

Alarm is screened as yawn detected with change in EAR.

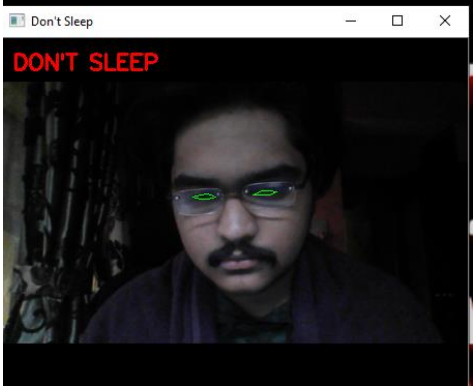



**Fig. D.2 (Face with specs)**

Alarm is screened due to change detected in EAR.

Thus, our proposed approach also gives the same accuracy for the people wearing spectacles. Accuracy of our proposed system improves with the increase in brightness of the surrounding environment.

## 4. CONCLUSION

In this work, a real time system that monitors and detects the loss of attention of drivers of vehicles is proposed. The face of the driver has been detected by capturing facial landmarks and warning is given to the driver to avoid real time crashes. The main aim is to prevent the driver from being distracted due to the sensors attached near his/her body. The proposed approach uses Eye Aspect Ratio with adaptive thresholding to detect driver's drowsiness in real-time. This is useful in situations when the drivers are used to strenuous workload and drive continuously for long distances. The proposed system works with the collected data sets under different conditions. The facial landmarks captured by the system are stored and machine learning algorithms have been employed for classification. This experiment can run as a part of pilot plan i.e. for a few days/months in different regions of the world where such incidents occur regularly. Thus, our proposed approach also gives the same accuracy for the people wearing spectacles. Accuracy of our proposed system improves with the increase in brightness of the surrounding environment. The work can be extended for different types users such as bike riders or in different domains like railways, airlines etc.

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