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# REAL-TIME DRIVER DROWSINESS DETECTION

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**Abstract -** *Deep learning techniques have been used inorder to predict the condition and emotion of a driver to provide information that will improve safety on the road. It is an application of artificial intelligence. An intelligence System has been developed to detect the drowsiness of the driver which can prevent accident and reduces loss and sufferings. A driver's condition can be estimated by bio-indicators, behaviour while driving as well as the expressions on the face of a driver. In this paper we present an all-inclusive survey of recent works related to driver drowsiness detection and alert system. We also present the various deep learning techniques such as CNN which specially designed to work with images and videos, HAAR based cascade classifier, OpenCV which are used in order to determine the driver's condition. Finally, we identify the challenges faced by the current system and it can be enhanced in future to the vehicles*

***Key Words***: **Artificial Intelligence, CNN (Convolutional neural network), Drowsiness Detection, Deep Learning.**

## 1. INTRODUCTION

One of the foremost frequent causes of road accidents is said to driver's drowsiness. The statistics show that drowsiness expose driver to higher crash risks, severe physical injuries, or maybe death, while the economic losses aren't negligible. A drowsy driver is in an exceedingly state of mental and physical flabbiness, which has decreased mental alertness and a sensation of tiredness. Being during this state, he not performs competence to safety driving man oeuvre. Drowsy driving could be a real problem in our society because it affects and puts at risk all traffic participants - drivers and pedestrians. the event of a system, which monitors, in real time, the driver's level of drowsiness will decrease the amount of car accidents and can save immeasurable lives everywhere the globe. the employment of such an assisting system, ready to measure the amount of vigilance is critical in car crash prevention. so as to develop the system is vital to understand to judge the extent of drowsiness. Four kinds of measurements are commonly accustomed check the extent of drowsiness. There are several approaches employed in face detection. a number of these encode the knowledge about characteristics of typical face and find structural elements - like eyebrows, eyes, nose, mouth and hairline- and use the relationships between them to detect faces. in a very method to spot the face from a cluttered background supported segmentation was proposed. The eclipse was fitted to the boundary between the top region and also the background and also the face are going to be detected. The human coloring and texture faces have also proven to be good features for face detection. For this method, the foremost important feature was the color which will be separated from other parts of the background. This method used maximal varieties variance threshold. Another method used for face detection was the histogram intersection within the HSV color space to spotlight the skin region. The template matching methods store several patterns of various faces to explain as a full or the face expression separately, by computing the correlations between an input image and also the stored pattern so as to work out the degree of similarity of the pattern to a face. There are several techniques which are used with this method. For detecting the features from the face here we use the CNN algorithm which extracts the features from the image screens. By detecting the features of eyes from the image, whether it's closed or opened we are able to identify the Drowsiness level of the motive force.

## 2. LITERATURE REVIEW

The developed system may be a real time system. HAAR based cascade classifier is employed for face detection. An algorithm to trace objects are wont to track the eyes continuously. so as to spot the drowsy state of the driving force, the CNN algorithm is employed. The paper focuses on developing a non-interfering system which might detect fatigue and issue a warning on time. The system will monitor the driver's face employing a camera. By developing an algorithm, the drowsy symptoms of driver are detected early enough to avoid accident. When the signs of fatigue are identified then a sound are produced as an attentive to the driving force unless he's awake from fatigue. Alert sound are deactivated automatically when the driving force is awake from the fatigue for a period of your time. this method will detect driver's fatigue by the processing of the attention region. After image acquisition, the primary stage of processing is face detection. If the eyes are closed for quite 0.7 seconds, this technique issues alert sound to the motive force. System makes use of the amount of eye blinks for detecting the state of drowsiness in an exceedingly driver. If eye of the driver is blinking it will not consider that as an issue. The system makes use of OpenCV and a camera. the attention status is obtained through image processing algorithms. this method takes under consideration only the state of the eyes, it doesn't concentrate on the frequency of

yawning. during this system computer vision are wont to detect drowsiness. Eye closure is detected using HAAR based cascade classifier this method includes two modules. the 2 modules are the face and eye detection module followed by the face tracking module. during this system convolutional layer is employed, a layer with series of mathematical operations is performed to extract the feature map of the input image. this technique also uses cascade classifiers so as to boost the accuracy of face detection. The status of the attention and therefore the time taken is noted as score. If the status is open then the score is zero. If driver feels fatigue and also the status changes to shut supported the video then the score will increase and an alarm sound are going to be raised to awake the motive force from fatigue.

## 3. OBJECTIVE

The main objective of the system is accurately detecting a driver's drowsiness supported eyelid movement and it gives an appropriate voice alert in real-time. the opposite objectives include designing a system that detects drowsiness of drivers by monitoring the eyes of the motive force regularly, especially the retina. The system should give an attentive to the driving force when the driver's eyes remain closed for some seconds. The system performs better even a driver is wearing spectacles. The system will give an alert sound for a particular period of your time until the fatigue drivers eyes is open normally with none drowsiness. this technique doesn't affect by bad lighting

## 4. METHODOLOGY

Firstly, the face is localized in the image using facial landmark detection. Then, shape prediction methods are used to detect important features on the face. Face detection is done by HAAR cascades, which are pre-trained. In the next step, to estimate the location of (x, y)-coordinates that map to facial structures. My model file was trained on CNN, so the best weights are already obtained for the model. The CNN consists of fully connected layer of 128 nodes. OpenCV is been used for gathering the images from camera and feed them into a Deep Learning model which will classify whether the person's eyes are 'Open' or 'Closed' respectively. Then an alarm sound is used as alert sound for the drivers to awake from the fatigue.

## 5. SYSTEM DESIGN

### 5.1 System Architecture

When the driver is driving is face captured by the camera and then it is converted into frames. Then the system analyses the drowsiness and amount of fatigue level. The detected facial image is processed to check whether the eyes of the driver is 'Open' or 'Closed'. If the eyes are opened then the alarm will be set off. if the eyes are closed for a certain period of time which is calculated as score. If the score is above the limitation, then an alarm sound will be raised to give an alert to the fatigue driver until the driver's eye is opened for a certain period of time. The alert sound will terminate automatically when the driver is away from the fatigue for a period of time. The flow of the system activity is clearly described in the Fig.1

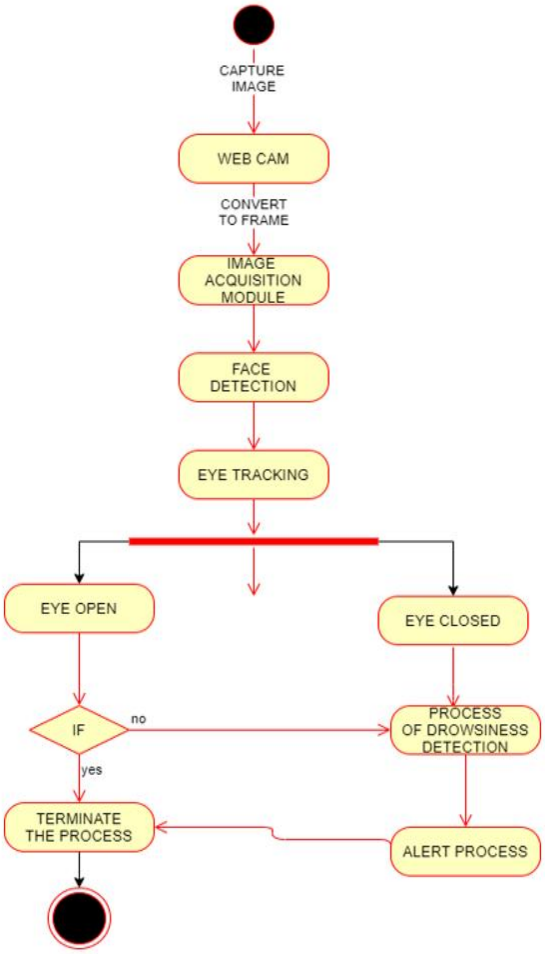


**Fig -1**: System Activity

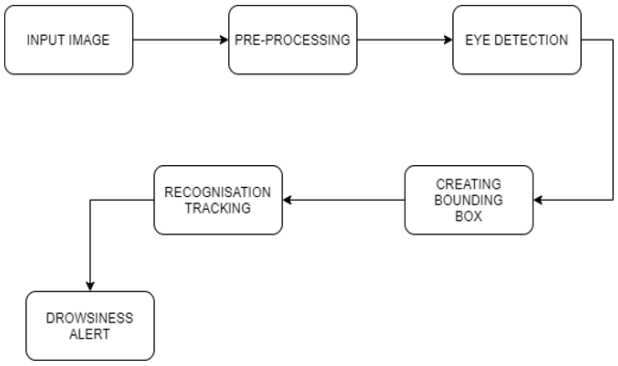


**Fig -2**: Data Flow in the System

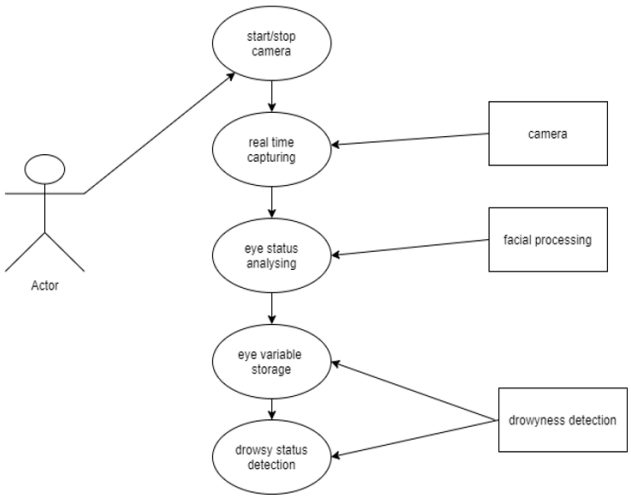


**Fig -3**: Use case Diagram

### 5.2 Detailed design

The eyes and mouth of the driver are always monitored by the camera which will be attached in the dashboard of the vehicle and if the predefined levels of alertness are observed to be defaulted and compromised, then an appropriate alarm is set off, and accordingly, action is taken to prevent any fatalities. Fig.4 depicts the System Design of Driver Drowsiness. It can be seen that the camera is used for monitoring the driver's face continuously and upon detection of drowsiness or fatigue, the system in the dashboard generates a alert sound continuously until the driver awakes from the drowsiness.

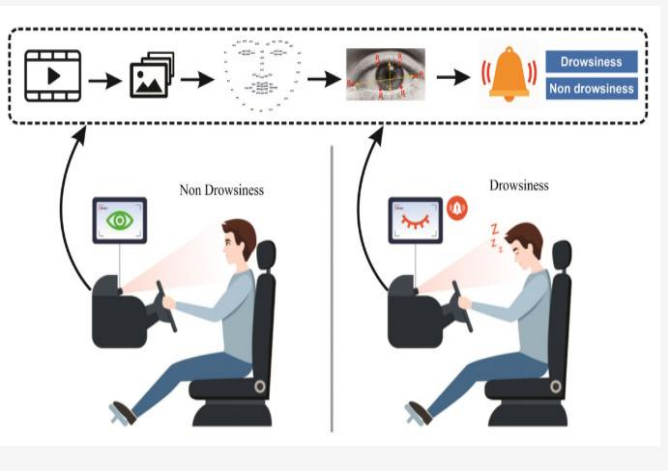


**Fig -4**: System Design

## 6. EXPERIMENTAL RESULTS

### 6.1 Experimental Dataset

The experimental dataset used in our project is a CNN trained model, so the best weights are already obtained for the model. We wrote a script to collect the images from camera then we separated them into their respective labels 'Open' or 'Closed'. The data was checked and the unwanted images has been removed which is mot necessary to build the model. the data comprises around 7000 images of people's eye under different lighting conditions. The dataset covers a large variety of identities, face size, lighting conditions, pose, etc. The dataset covers a large variety of identities, face size, lighting conditions, pose, etc. After training our model it is attached as model architecture file "models/cnnCat2.h5.

### 6.2 Performance Analysis

A large amount of picture was taken to achieve these expected results. Fig.5 represents the output when the eyes is opened. the score will also be remained zero and no alarm sound will be raised. Fig.6 represents the output when the eyes is closed and the driver feels fatigue for a certain period of time. the score will be raised accordingly to the time taken if the score crosses its limit, then the alarm sound will be produced to create an alert to the driver, so that driver can awake from the fatigue state.

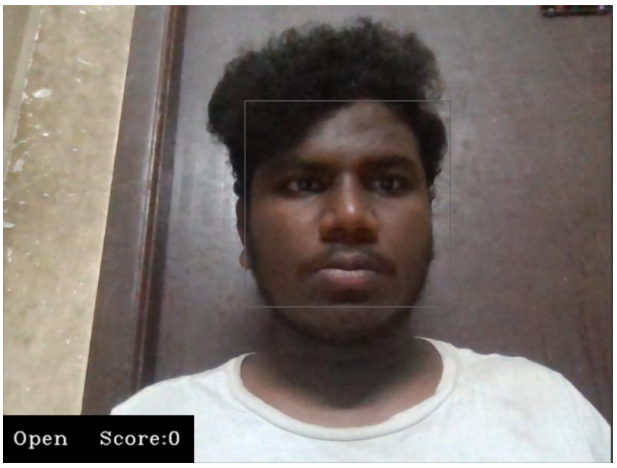


**Fig -5**: Eyes opened and the driver is in normal state


**Fig -6**: Eyes closed and the driver is in fatigue state

## 7. CHALLENGES

The accuracy of the model degrades if the attention frames aren't captured clearly thanks to any quite obstacles like goggles, sunglasses, spectacles (having reflection). Camera operations like auto adjustments with regard to zoom and rotation aren't considered in conducting experiments. Once the eyes are limited in position, zooming the camera will help to increase the accuracy. The accuracy of detection of eyes and mouth reduces when the motive force isn't facing the camera

## 8. FUTURE ENHANCEMENT

The model is improved incrementally by using other parameters like blink rate, yawning, state of the car, etc. If of these parameters are used it can improve the accuracy by lots. We conceive to further work on the project by adding a sensor to trace the guts rate so as to forestall accidents caused thanks to sudden heart attacks to drivers. Same model and techniques may be used for various other uses like Netflix and other streaming services can detect when the user is asleep and stop the video accordingly. It can even be utilized in application that stops user from sleeping.

## 3. CONCLUSIONS

This project presents a prototype implemented in small scale actually. It shows implementation under various scenarios like low light, dark and also the system seems to provide efficient results under these conditions. In future we decide to improve the programme which wasn't of much importance currently. Moreover, we attempt to extend the research by analyzing road conditions too with the assistance of rear camera. With some more improvements the system is placed in use for general public.

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