DRIVER DROWSINESS DETECTION SYSTEM

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ABSTRACT:
Car accident is the major reason behind death during which around 1.4 million people die once a year. Majority of those accidents are caused mainly due to distraction or the drowsiness of driver. Various studies proposed that around 20% of all road accidents are fatigue related. Recent statistics shows that on an average approximately 1,200 deaths and 76,000 injuries are often attributed to fatigue related crashes. We built a model utilizing a combination of driver's state and driving sleep status. Model observes the attention, blinking rate and flickering span. Generally fatigue drivers have this ratio beyond ordinary person. Studies have shown that around quarter of all motorways accidents are attributes to sleepy drivers, drowsiness causes more accidents than drink-driving. Thus this model can prevent from these accidents by not letting driver getting drowsy and play an alarm sound to alert the person. We utilized a camera with machine vision procedures to search out and watch driver's blinking behavior. The difference esteems were utilized to separate weakness drivers, which are accepted to own higher driving exercises, from typical drivers.

Keywords- Drowsiness detection, Driver Fatigue, CNN (convolution neural network), Region of Interest (ROI).

1. INTRODUCTION

Driver drowsiness detection is car safety technologies which prevent accidents when the driver is getting drowsy. Car accident is the major cause of death in which around 1.4 million people die every year. A lot of accidents are caused because of distraction or the drowsiness of driver. [1] Construction of high speed highway roads had diminished the margin of error for the driver. The countless number of people drive for long distance every day and night on the highway. There are many factors like lack of sleep or distractions like the phone call, talking with the passenger, etc. may lead to an accident.[1] Various studies proposed that around 20% of all road accidents are fatigue related. Driver fatigue is a significant factor in large number of vehicle accidents. Recent statistics estimates that annually 1,200 deaths and 76,000 injuries are often attributed to fatigue related crashes. [2]. there are four main causes of driver fatigue: sleep, work, time of day and physical. Nowadays people try to do a lot of work in one day due to which they lose their precious sleep. They often take caffeine or other stimulants in order to stay awake. The

Shortage of sleep builds up over a variety of days and the next thing that happens is that the body finally collapses and therefore the person falls asleep. Time of the day factors can often affect the body. Extending the time awake will eventually result in the body crashing.

Physical condition of an individual also plays a major role. People sometimes are on medications that make drowsiness or have physical ailments that cause these issues [3].

Being physically unfit, by being either under or overweight, will cause fatigue. Therefore, there's a requirement to develop a system which is able to detect and notify a driver of his psychophysical condition, which could significantly reduce the quantity of fatigue related car accidents. However, the most important difficulties in development of such a system are associated with fast and proper recognition of a driver's fatigue symptoms. Due to the increasing amount of vehicles on the road, which translates into road accidents directly, equipping a car with the fatigue detection system is a must. One of the technical possibilities to implement such a system is vision-based approach. With the rapid development of image analysis techniques and methods, and a variety of ready Component- on-the Shelf solutions, it can be envisaged, that introducing such systems into widespread use should be easy. Car drivers, truck drivers, taxi drivers, etc. should be allowed to use this solution to increase the security of the passengers, other road users and also the products they carry.

2. PROPOSED APPROACH TO DETECT DRIVER'S DROWSINESS

There are total 68 landmarks point in our face which determine or facial movements each landmarks contribute to and show movements and helps in detecting various emotions these forms some micro expression which is also used to detect lie. We also uses these landmarks to detect whether a person is drowsy or not. When we drowse we move many of these facial landmarks for example. When we drowse

• We open our mouth and distance between lips increase. • We close our eyes. In this project we will only focus on eye movement or our eyes to and calculate distance between upper eyelid and lower eyelid to determine whether eye is closed or not.

2.1 The Dataset

Data Augmentation: To increase the dataset we use data augmentation method to produce different images or to increase variance between datasets images by applying different filter to increase in so that datasets also contain images of faces in different lighting and different angles. This method was used to generate new images by performing a set of augmentation operations on the images

extracted from video frames. Library utilizes the power of Open CV Haar
Cascades files to detect facial landmarks. This technique uses many images that are either positively or negatively marked for the presence of an object that is to be detected.[4] In this we used our face as an object to be detected. From this, the algorithm will be able to detect new facial images that are fed into the algorithm. The dataset used for this model is created by us. To create the dataset, we wrote a script which detect eyes from a camera and stores in our computer disk after that we separated data and wrote label on them as

'Open' and 'Closed'.

The data was cleaned by removing the unwanted images which were not good for building the model. The data contain total of 10000 images of people's eyes under different lighting conditions. We classify data into 0,1 format where 0 represent eyes closed and 1 means eye is open.

2.2 The Model

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. Using CNN we perfumed convolution operation on layer using filters which perform 2D matrix multiplication on layer by applying using various filter. The final layer is a fully connected layer with 2 output nodes. In all the layer except outer layer we used Relu activation function and in last layer we used Softmax activation function.

2.3 The Detection

With a webcam, we will take images as input. So to access the webcam, we made a loop that will capture each frame for set duration of time. We use the method provided by OpenCV, to access the camera and set the capture object. cap.read() will read each frame and we store the image in a frame variable and from there it will make a square box which will contain the Region of Interest (ROI).[5] First it will detect the face by drawing ROI in face and converting these image to grey scale and this will return the x , y coordinates of ROI which contain face.[5] After that it will detects eyes from ROI and feed it to classifier and will extract only eye image from classifier it will also reshape image of both the eyes into 24x24 image size because we make datasets of same size. Both the eyes are checked separately to know whether they are open or close hence even if one is closed and one eye is open the counter will not go up and play alarm. 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 score and when eyes are open, we decrease the score. We are drawing the result on the screen using cv2.putText () function which will display real time status of the person. A threshold is defined for example if score becomes greater than 16 that mean the person's eyes are closed for a long period of time. This is when we beep the alarm. Score increase faster if the eyes are closed for long period of time hence if eyes are close for more than 4 second the alarm will ring

2.4 The Method

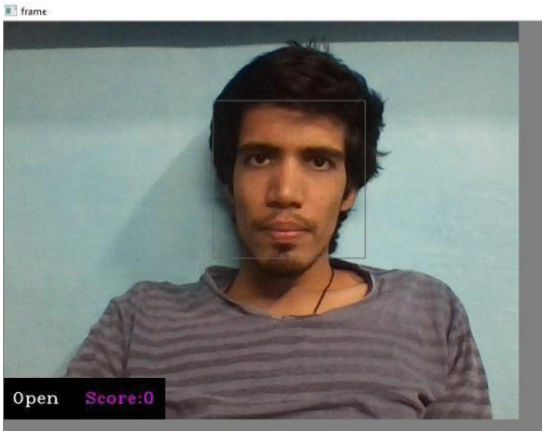
The drowsiness detection relies on Convolution Neural Network (CNN) learning and also the data fusion of some advanced pointers acquired. Driver bodily pointers are get information from vision system. The camera touchy to the NIR, are set before the motive force to get pictures of the driving force freely of encompassing striking surroundings. The most important case of bad illumination, the NIR consequently remain on and therefore the other way around. Picture handling method to handle the attention detection/tracking and conclusion parameterization to estimate pieces of data. They acquired through accompanying enlisted motions from vehicle: controlling wheel developments, blunder and parallel site. upon the information sources. Ideal mixes of an assortment within the writing assessed through advantageously trained method CNN wont to gather arrangements through vision without earlier learning of the examples. At that time, the most effective performance in driver fatigue considers, as indicated by the simplest in school. this technique recovers review rates within the vicinity of 55% and 90%, contingent A driver's conduct is perplexing, variable and non-direct. one in all the principle points of interest of coaching method is that they deduce arrangements supported earlier information. This trademark is significant thanks to driver conduct examines, correct info yield connection is tough to make up. CNN likewise can sum up, which is extremely useful, because true data is loud, mutilated and often fragmented. CNN are nonlinear, which enables them to require care of some incredible issues more accurately than straight strategies. during this work, a standout amongst the foremost vital styles of CNN, is used, where respectively layer comprises of neurons accepting contributions straightforwardly beneath and yields specifically over the unit. For situation, information more matured the layers. Yield signals from concealed neurons were responded to a solitary yield neuron, thus producing the yield.

3. RESULTS

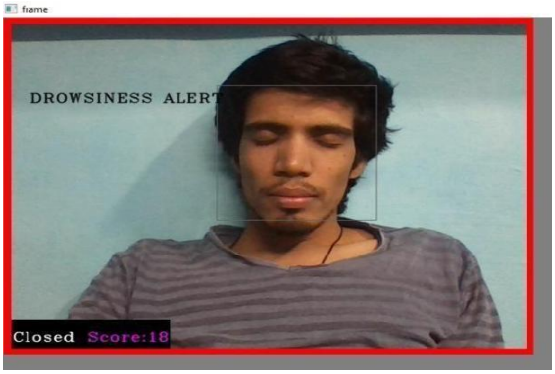
Driver Drowsiness is detected using open CV library where images are captured at regular intervals to detect the drowsiness of person and score is running with drowsy image to play alarm sounds.

Below are images of persons showing drowsiness and awake detection of a person sitting in car.:

1. Image of person not getting drowsy hence score is 0.



2. Image of person feeling drowsy hence score is reached 18 and alarm will be played..



Various samples with various accuracies were taken and a table plotted for them.

S NO.	Score	Drowsiness alert	Alarm Status
1.	0	Not detected	Not Played
2.	10	Not detected	Not Played
3.	15	Detected	Not Played
4.	20	Detected	Played alarm

After score is getting reached 10 on image it increases at a very faster rate as after it drowsiness of person is detected and to prevent any misshaping as soon as it reaches around 16 in score drowsiness alert alarm is played.

On recording with **timer it is observed that in nearly 4 seconds alarm is played in our model** after drowsiness of person is detected. **Accuracy of model is found to be 91**% when performed with a larger dataset and images in various lightning and dark conditions were taken in consideration

4. CONCLUSION

In this research paper, we have reviewed the technology to determine the drowsiness state of a driver. Although there is no universally accepted definition for drowsiness, the various definitions and the reasons behind them were discussed. The drowsiness detection and correction 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, masks 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 three seconds, the alarm beeps to alert the driver and the speed of the vehicle is reduced. By doing this many accidents will be reduced and provides safe life to the driver and vehicle safety. This paper tries to look at the emerging technologies and determine the best approaches in trying to prevent the number one cause of fatal vehicle crashes. Currently, the number one selling product in the market is the market is nothing more than a reed switch to detect head angle tilt. This product is extremely limited and not very effective. A system for driver safety and car security is presented only in the luxurious costly cars. Using drowsiness detection systems, driver safety can be implemented in normal and basic cars also

5. FUTURE SCOPE

1. This project is implemented within sort of mobile application to cut back the cost price of hardware [1].
2. This project are to be often integrated with car in order so that automatic speed control can be imparted if the person driving vehicle is found sleeping [1]
3. Our model is intended for detection of drowsy state of eve and provides and alert signal or warning within the style of audio alarm. But the response of driver after being warned might not be enough to prevent causing the accident meaning that if the driving force is slow in responding towards the signal then accident may occur [6]. Hence to avoid this we are able to design and fit a motor driven system and synchronize it with the sign in order that the vehicle will weigh down after getting the alarm automatically. we will also provide the user with an Android application which is able to provide with the data of his/her drowsiness level during any journey. The user will know Normal state, Drowsy State, the amount of times blinked the eyes consistent with the amount of frames captures.

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