

DRIVER DROWSINESS DETECTION SYSTEM

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Abstract

A Driver who sleeps or feels drowsiness or fatigue at the time of driving is more dangerous when compared to the person who does over speeding. Even the drivers who drives for long trip needs to have the long-term concentration. Drivers must need to keep an eye on the road, so that they can react to sudden events immediately. The major and significant causes of road accidents are drowsiness and fatigue of the drivers. Every year these reasons increase the number of deaths and fatalities injuries across the world. So, there is a need to develop a system, which will be able to detect the drowsiness of the driver while driving. Here we design a system that works on convolutional neural network, which helps to detect the drowsiness by means of visualizing the eye closure from the face and alerts the driver with a beep sound when he closes the eyes for a long time and also starts the video recording and sends that video to emergency contacts as an email in order to notify the situation. . The existing system uses more than two sensors, in which an iris sensor is used to detect whether the eye is closed or not and other sensor is used to calibrate the sudden turn of wheels and also the detection of the sudden drop of the vehicle's speed. The integration of all these sensors will be expensive and even if one sensor fails, then there will more chances for not working of the other sensors. The use of iris sensor works by using the Ultraviolet rays for the detection of the eye. But the exposure of eyes to the ultraviolet rays for a long period of time will affect the eyes. Since we use the CNN model algorithm for the detection it gives the accuracy based upon the value given by us to measure the closure property associated with the eyes.

accidents results in the loss of people lives and also making the people handicapped every year. Going with details of the last decade which are revealed by a study by world bank, road accidents caused for 13 lakh people, and also more 50 lakh people have been injured in our country. While going through the numbers, India has only 1% of total vehicles in the world, but our country accounts for 11% of the global death due to the accidents. It is the highest percentage when compared to the other countries in the world. Approximately India accounts for 4.5 lakh road accidents, which is around 1.5 lakh lives. For every hour there will be 53 road accidents happening on an average and one person gets killed in every 4 minutes in a road accident.

Keywords: CNN Model Algorithm

1.INTRODUCTION

India is one of the countries which has a high number of deaths caused due to the road accidents. Most of these

Mostly accidents happen on highways which involves large commercial vehicles. There are several reasons behind these accidents, but one of the most common reason is due to drowsiness. A study conducted by savelife foundation and Mahindra says that drivers in India covers 400kms in 12 hours a day, 50 % of them admits that they feel drowsy sometimes during the driver. Sleep leads to the road accidents, it increases the risk of road accidents by 300% and it is major factor behind the road accidents in India. There are many people who suffer from sleep apnea around 28 million, and we can say that, this leads to many drowsy drivers on Indian roads. They are around 2.6 times prone when compared to the general drivers.

Back in 2016, the deaths and genuine wounds brought about by road crashes cost around 7.5% of India's GDP or ₹12.9 lakh crore, listed by the World Bank study. The amount is more than twice the figure listed by the Indian government at 3% of GDP or ₹4.3 lakh crore. As per the Ministry of Road Transport and Highways (MoRTH) discoveries, the financial expenses of road crashes in India are approximately ₹147,114 crore, which is around 0.77% of the nation's GDP.

The injuries and deaths due to the road accidents impose a severe financial burden and push the respective victims' households into poverty and the already poor into debt. Road crashes also impact heavily on the country's human assets. Around 76.2% of people who are killed in road crashes in India are in their prime working-age, 18-45 years. This means the country loses a massive number of its workforce every year, just because of road accidents.

Face recognition of the driver will be done by the web camera placed Infront of the driver which is connected to rasp berry pi device. A speaker is also connected to this device. The raspberry pi device is a device similar to the CPU of a computer, but the only difference is that the computation power of this device is less when compared to the original computer. Face recognition entails 2 actions, the first phase consists of detection of the face from the video, and the next phase is to check the state of drowsiness of the driver. It first extracts the face region and extracts the region of eyes from the extracted part. The procedure of detection of faces is done by haar cascades. When the system detects the sign of drowsiness state in the face of the driver then the speaker beeps an alarm sound until the driver awakes and get back to the normal state. The email consisting of the recorded video of driver will be sent to the legal authorities immediately.

II.RELATED WORK

The present system has many complexities in the drowsiness detection system. Some of them are discussed below.

One approach is to notify the changes in the vehicle behavior. As Mc Donald et al created a temporal algorithm which utilizes the speed of the vehicle, angle of the steering and accelerator pedal positions. After getting all those values, they are passed as a parameter into a Bayesian network, which determines if a driver is in state of drowsiness. The algorithm was found that it has much lower false-positive rates when compared to that of PERCLOS method.

Another approach is to measure the eye lid curvature, by using that value we can detect whether the eyes are closed or open. But it won't work properly in the dark. There is another approach that makes the use of iris sensor to detect whether the eyes are closed or opened. But the iris sensor makes use of ultraviolet rays, which is harmful for eyes as if they were exposed to the eyes for a long period of time.

The companies were trying to follow is that, to develop a smart glass that helps in the drowsiness detection by including blink detection, eye tracking and monitoring of

vitals. But the implementation of all these techniques is quite expensive. Since there are more drivers in India won't be able to bear the cost of such expensive items, it won't be practically implemented in India

III. PROPOSED WORK

We use a raspberry pi device, which acts as a mini computer which can be connected to a speaker and web camera. The web camera is used to detect the image of the driver while the speaker is used to generate the alert sound and the co-ordination of these devices is done by raspberry pi device. The raspberry pi device also sends the recorded video of the driver to the emergency contacts mentioned while installation. It also gives a beep sound through the speaker.

The algorithm we are using here is CNN, which stands for Convolution neural network. It is a deep-learning algorithm which can take an input image and assign importance to various objects (in our system, the importance is assigned for the detection of eyes) in the image and be able to differentiate from other. The main reason for the use of CNN algorithm is that because it gives high accuracy for tasks such as image classification and recognition.

The proposed system has classified its working process into 4 phases. They are

- A) Image Visualization
- B) Image Processing
- C) Drowsiness Detection
- D) Alerting of Driver
- E) Sending E-mail notification

A. Image Visualization:

The web-camera placed in front of the driver captures the image of the driver. The OpenCV module used in our system helps to perform the task of image visualization. The extraction of image from the picture which is taken by the web-camera takes place.

B. Image Processing:

The image processing is done by keras module. In this phase, the face is extracted from the photo and then from the facial coordinates, the left eye and right eye regions are detected. This library is programmed to find out the (x, y) coordinates of the facial landmarks to map the facial structure. Here haarcade proposed framework giving which gives a highest detection rate and it is also much faster than the other methods.

C. Drowsiness Detection using proposed algorithm:

The input to the algorithm is the facial coordinates, that are extracted from the input images by means of using Dlib library. The presented model has five layers as of CNN approach.

The output of the algorithm will be of five steps. They are

- 1) Loading the data.
- 2) The scaling of minimum and maximum in order to normalize the dataset between the range 0 and 1.
- 3) After that hidden layers and dropout needs to be added:
 - a) Linear activation of first convolutional layer. The input layer consists of 134 nodes with 100 neurons.
 - b) LeakyReLU is a function, which allows the, small gradient when the unit is not active and also scales the alpha rate to 10 percent.
 - c) Another function named MaxPooling will reduce the number of parameters in the model.
 - d) In order to prevent over-fitting, Drop-out is set to 20%.
- 4) Fully connected layer with the help of a softmax function to get the class output probabilities.

4. Alerting of Driver:

When the algorithm returns the output as the driver is in state of drowsiness, then the speaker will play a sound so that driver will awake and returns to his normal state.

5. Email- Notification:

After the algorithm detects the driver's drowsiness, the beep sound plays by the speaker and also the video recording will be started because the recordflag turns to be true and that video recording is sent through email to legal authorities.

IV. RESULT ANALYSYS

The drowsiness detection system is able to detect the face of the driver when he is asleep and also awake. When the driver closes his eyes, until a particular amount of threshold time, we use a variable to count the score, till which he closes the eyes. When the score reaches the threshold value, then the alarm starts to beep and also the email notification will be sent to the legal authorities.



Fig1. Proposed drowsiness detection

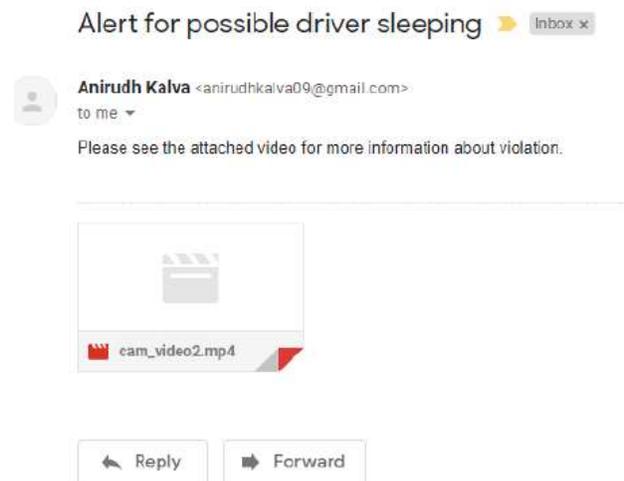


Fig2: Email Notification of Proposed System

V. FUTURE SCOPE

This model can be improved incrementally by using other parameters like blink rate, state of the car, yawning etc. The software needs to be developed in such a way that it can also work in the dim light and also able to send the location of the vehicle along with the video recording.

Some model techniques can be used for various other applications like Netflix or amazon prime so that when the user falls asleep then the application gets turned off itself.

V. CONCLUSION

This driver drowsiness detection system is not expensive. The integration of this system is also easy. Even the new vehicles are coming with the auto pilot features, those vehicles are not present in India. Since, it takes a lot of time for those kinds of vehicles to be produced in India. Even though they are produced, it is not easy to replace all those vehicles all at a time. So, considering all those factors, our detection system seems to be a best idea among the present alternatives or methods. We can conclude that it will be useful in detecting driver's drowsiness and inform the legal authorities.

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