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Driver Drowsiness Detection Using Face Expression Recognition

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ABSTRACT

This paper concentrates on detecting the drowsiness in the driver based on their facial expressions using Machine Learning. Many facial expressions can be fed to the system so that it will be able to distinguish between the exact point of drowsiness and other types of expressions. The model we used is CNN(Convolutional Neural Networks).The CNN is used to give scores according to the eye opening and closing time of the person and alert is sent. For score zero the eye will be wide open, and score will be increasing according to the time the eye remains close. Alert will be send immediately to alert the person if the eye remains close for a long time.

KEYWORDS

Expression Recognition, Characteristics Sensing, Method ad OpenCV.

Introduction

When it comes to transport safety comes as the first priority. Despite many safety measures and features in an automobile, Drowsiness in the driver can cause fatality to the passengers.

There are different kinds of approach for this system, one method is to install sensors on standard vehicle components such as steering and accelerator, and then analyse the signals to identify any driver drowsiness.

Second set of technique involves in measuring of heartrate, pulse rate, EEG and other physiological components to detect the drowsiness of the driver.

The third set of technique involves in detecting any changes in the appearance and facial movements that occur when drowsy.

The efficient way is to enter different data of facial features and movements during various situations. It helps the system to differentiate among the vast range of expressions to the required detection of the drowsiness. It analyses the blinking of eye, time the eye remained closed, interval of eye open and close, yawning etc.,

Literature Survey

The Author Jayusenan J. S und Mrs, Smitha P.Sexplained four methods to detect drowsiness:

1) Physiological characteristics sensing,
2) Driver operation Sensing,
3) sensing the response of the Vehicle.

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4) Driver responsemonitoring.

Out of these, the first two methods are accurate but expensive and need brainwave sensors which cannot be used. Whereas, sensing the vehicle responses and monitoring the driver response are good methods and can be easily implemented.

Author Mrs.S. Dhanutakstmi, et.al. Jasmine Rose PetgLeema Rose, M.Phikominal paper explained important part to detect the face and Localize the eyes, but it is more important to train the machine efficiently work that machine is an effectively to find the eyes and sleepiness Non-intrusive machine vision based drowsy driver detection system during which pictures are used to detect eye position and eye blinking innate reflexing and eye blink frequency to calculate sleepiness detection will work utterly and may save the lives of the many folks. Numerous papers show that victimization SVM will create the system strong however will increase complexness of the system.

In 2008, HONG Su et.al. "Squares Regression-Based Fusion Model for Predicting Drowsiness" was defined. It is suggested that partial least squares information fusion technique for modelling driver drowsiness with multiple eyelid movement features (PLSR) with that to deal with the matter of robust co-linear relations among protective fold movement options and, thus, predicting the tendency of the sleepiness.

In June,2010, Bin Yang et.al under simulated or observed conditions, “Drowsiness is referenced for the Driver State of eye and Head pose for Driver Alertness” is found.Physical measurements are based on the results of the most recent in-vehicle eye monitoring system. These metrics are assessed statistically and using a classification methodology based on a large database of 90 hours of real-world driving time.

In June 2012, A. Cheng et.al. ‘Driver Drowsiness Recognition Based on Computer Vision' was the title of the paper. Image processing and eye tracking is used to recognize a non-intrusive sleepiness. Due to the changes in illumination and driver posture a strong eye detection algorithm is given to handle the problems caused by the change. Percentage of eyelid closure, maximum closure duration, blink frequency, average opening level of eyes, and closing of eyes are the six measures that are calculated. 86% of accuracy is shown in the video-based drowsiness recognition.

In June, 2014, Eyosiyas et.al. Proposed ‘Drowsiness Detection through HMM based Dynamic detection’.According to the proposed approach, facial expression is analysed and sleepiness is detected using Hidden Markov Model (HMM) based dynamic modelling. They used a virtual driving environment to enforce the algorithm. The proposed technique's effectiveness was confirmed by experimental findings.

In August 2014 Garca et.al. Based on 3-D information from a range camera, a solution for driving observance and event detection is proposed. The method combines 2-D and 3-D techniques to determine head pose and identify regions of interest. The points related to the head are calculated and extracted for further study, the 2-D projection was analysed based on the cloud of 3-D points captured by the sensor.

Proposed Methodology

While tracking the image of the driver the system analyses the closing and opening of the eye. The model we used is CNN(Convolutional Neural Networks).

In a CNN operation, there will be three layers: an input layer, an output layer, and a hidden layer with multiple layers. These layers will be convolutional using a filter that performs 2D matrix multiplication on both the layer and the filter.

The detection process in the program is taken place in a few steps:
Step-1: The input is the image that is taken from the Camera.
The picture that is taken by the webcam is considered input and it is further accessed in to an infinite loop. The infinite loop will be recording every frame and the image is kept in the frame variable. To access the camera and to set the recorded object we will use the given method ad OpenCV.

Step-2: (ROI)Region of Interest is created by detecting the face in the image.

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The image is first opened in gray scale for the detection as the algorithm for the object detection in OpenCV takes gray scale images in the form of input.
An array of objects is created with detections of x and y coordinates as height and breadth of the boundary box of the object. Boundary boxes are being drawn for the each captured face with the iteration.

Step-3: The detected eyes from the ROI is then ingested in to the classifier.
A cascade classifier is used to detect the eyes in the left eye and right eye respectively then notices the eyes, which is the same classifier that is used to detect the eyes first. Now we must extract only the details about the eyes from the entire picture. This can be done by removing the eye's boundary box first, then using a code to delete the eye image from the image.

Step-4: The state of the closed or opened eye is detected by the classifier.
CNN classifier is used to anticipate the eye status. Specific operations is to be performed to feed image into model because the model wants the correct dimensions to begin.

Step-5: Score is checked to calculate weather the person is Drowsy or Not:
The score is essentially a number that will be used to assess how far the eyes have closed. So, if two eyes are completely closed, we will continue to increase the score until it reaches a certain amount, at which point the alarm will be activated, and if both eyes are open, we will continue to decrease the score until the alarm is turned off.

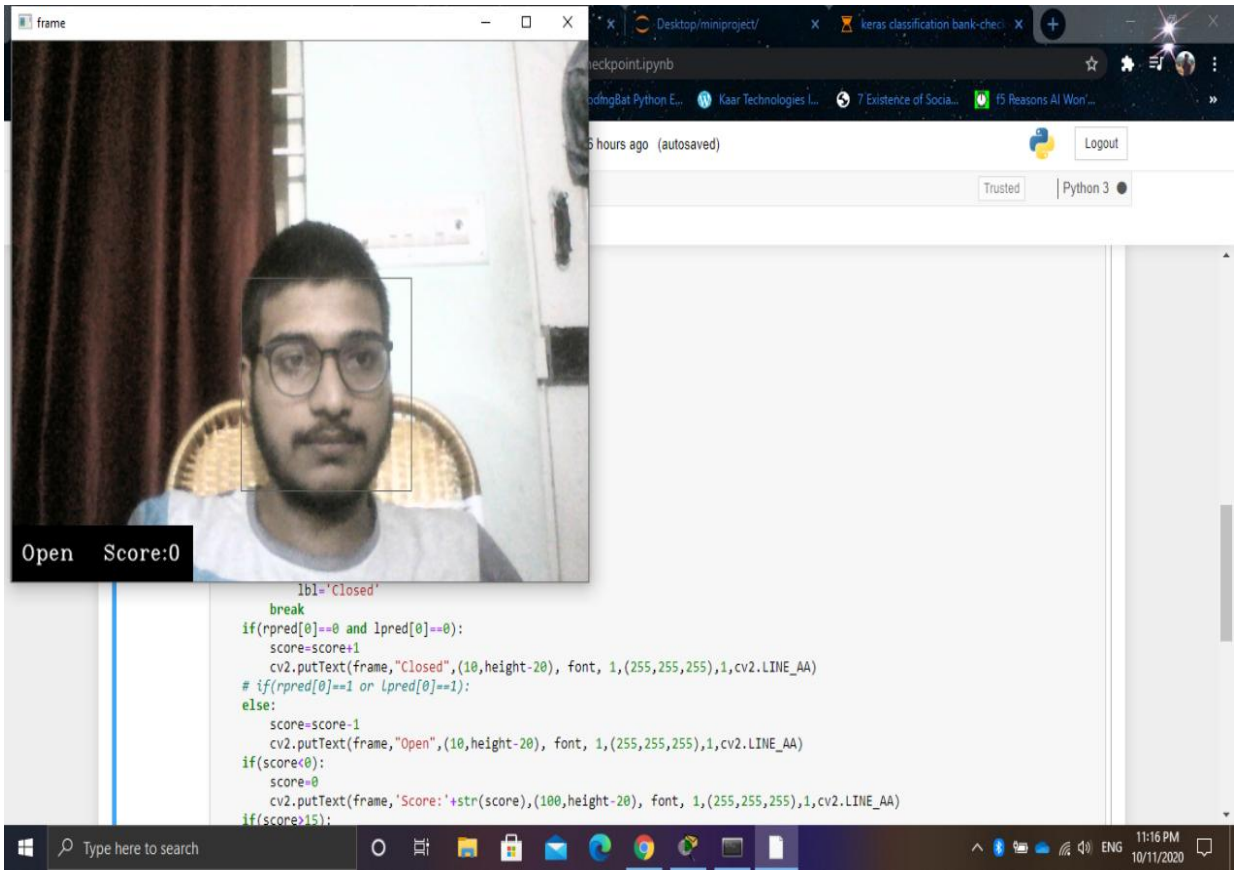

Fig. 1

Here in fig:1 when the person eyes are open the score given is Zero and no action or alert will be passed.

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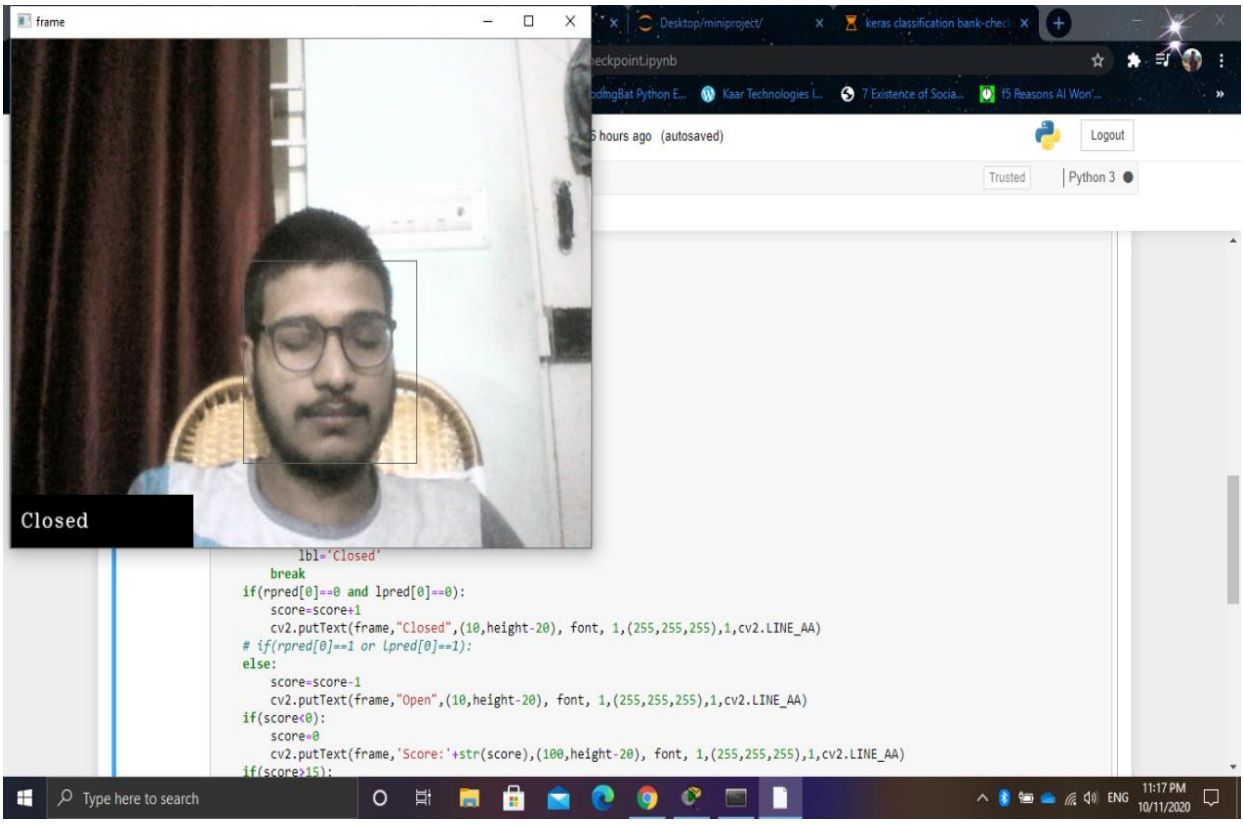

Fig. 2

In fig:2 the program detects that the eyes are closed and according to the rate of blinking and the time-period of the eyes closed it sends an alert as the sign of detection of drowsiness.

Result

By calculating the score system decides whether or not to send an alert regarding the Drowsy driver. The main intension behind the paper is the Safety of the people travelling. It analyses the behaviour of the driver and alerts prior. As a result the driver will be alert and it will help in decrease of many road accidents.

Many drivers delivering goods among various states, despite their long travels they will be alerted in prior and problem of getting involved in a road accidents will decrease. As soon as they get an alert, necessary actions can be taken to have an effective and safe travel.

References

[1] United States Department of Transportation.*Intelligent vehicle initiative.*http://www.its.dot.gov/ivi/ivi.htm

[2] Takei, Y., & Furukawa, Y. (2005). Estimate of driver's fatigue through steering motion. In *2005 IEEE international conference on systems, man and cybernetics*, *2*, 1765-1770.

[3] Kei, I., Kazuya, T., Fumitada, I., &Huseyin, A. (2005). *DSP forIn-Vehicle and mobile Systems*. Springer US.

[4] Cob, W.A. (1983). *Recommendations for the practice of Clinical neurophysiology*.Elsevier.

[5] Zhang, Z., & Zhang, J.S. (2006). Driver fatigue detection based intelligent vehicle control. In *18th International Conference on Pattern Recognition (ICPR'06)*, *2*, 1262-1265.

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[6] Friesen, E., & Ekman, P. (1978). Facial action coding system: a technique for the measurement of facial movement. *Palo Alto*, *3*(2), 5.

[7] United Stated Department of Transportation., *Saving Lives through advanced Vehicle Safety technology*. http://www.its.dot.gov/ivi/docs/AR2001.pdf

[8] Eoh, H.J., Chung, M.K., & Kim, S.H. (2005). Electroencephalographic study of drowsiness in simulated driving with sleep deprivation. *International Journal of Industrial Ergonomics*, *35*(4), 307-320.

[9] Gu, H., Zhang, Y., & Ji, Q. (2005). Task oriented facial behavior recognition with selective sensing. *Computer Vision and Image Understanding*, *100*(3), 385-415.

[10] Bartlett, M.S., Littlewort, G., Frank, M.G., Lainscsek, C., Fasel, I.R., &Movellan, J.R. (2006). Automatic recognition of facial actions in spontaneous expressions. *Journal of multimedia*, *1*(6), 22-35.