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ADVANCING ROAD SAFETY WITH DROWSINESS DETECTION

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ABSTRACT_ In this project by monitoring Visual Behaviour of a driver with webcam and machine learning SVM (support vector machine) algorithm we are detecting Drowsiness in a driver. This application will use inbuilt webcam to read pictures of a driver and then using OPENCV SVM algorithm extract facial features from the picture and then check whether driver in picture is blinking his eyes for consecutive 20 frames or yawning mouth then application will alert driver with Drowsiness messages. We are using SVM pre-trained drowsiness model and then using Euclidean distance function we are continuously checking or predicting EYES and MOUTH distance closer to drowsiness, if distance is closer to drowsiness then application will alert driver.

Keywords Magnetic heads,Vehicles,Nose,Face,Ear,Mouth,Feature extraction

1.INTRODUCTION

Drowsy driving is one of the major causes of deaths occurring in road accidents. The truck drivers who drive for continuous long hours (especially at night), bus drivers of long distance route or overnight buses are more susceptible to this problem. Driver drowsiness is an overcast nightmare to passengers in every country. Every year, a large number of injuries and deaths occur due to fatigue related road accidents. Hence, detection of driver's fatigue and its indication is an active area of research due to its immense practical applicability. The basic drowsiness detection system has three blocks/modules; acquisition system, processing system and warning system. Here, the video of the driver's frontal face is captured in acquisition system and transferred to the processing block where it is processed online to detect drowsiness. If drowsiness is detected, a warning or alarm is send to the driver from the warning system. This is a nonintrusive measurement as the sensors are not attached on the driver. In behavioural based method [1- 7], the visual behavior of the driver i.e., eye blinking, eye closing, yawn, head bending etc. are analyzed to detect drowsiness. This is also nonintrusive measurement as simple camera is used to detect these features. In physiological based method [8,9], the physiological signals like Electrocardiogram (ECG), Electooculogram (EOG), Electroencephalogram (EEG), heartbeat, pulse rate etc. are monitored and from these metrics, drowsiness or fatigue level is detected. This is intrusive measurement as the sensors are attached on the driver which will distract the driver. Depending on the sensors used in the system, system cost as well as size will increase. However, inclusion of more parameters/features will increase the accuracy of the system to a certain extent. These factors

motivate us to develop a low-cost, real time driver's drowsiness detection system with acceptable accuracy. Hence, we have proposed a webcam based system to detect driver's fatigue from the face image only using image processing and machine learning techniques to make the system low-cost as well as portable.

2.LITERATURE SURVEY

Intelligent Video-Based Drowsy Driver Detection System under Various Illuminations and Embedded Software Implementation

An intelligent video-based drowsy driver detection system, which is unaffected by various illuminations, is developed in this study. Even if a driver wears glasses, the proposed system detects the drowsy conditions effectively. By a near-infrared-ray (NIR) camera, the proposed system is divided into two cascaded computational procedures: the driver eyes detection and the drowsy driver detection. The average open/closed eyes detection rates without/with glasses are 94% and 78%, respectively, and the accuracy of the drowsy status detection is up to 91%. By implementing on the FPGA-based embedded platform, the processing speed with the 640×480 format video is up to 16 frames per second (fps) after software optimizations

"Driver Fatigue Detection based on Eye Tracking and Dynamic Template Matching"

A vision-based real-time driver fatigue detection system is proposed for driving safely. The driver's face is located, from color images captured in a car, by using the characteristic of skin colors. Then, edge detection is used to locate the regions of eyes. In addition to being used as the dynamic templates for eye tracking in the next frame, the obtained eyes' images arealsoused for fatigue detection in order to generatesome warning alarms for driving safety. Thesystem is tested on a PentiumIII 550 CPUwith128 MB RAM. The experiment results seemquite encouraging andpromising. The systemcanreach 20 frames per second for eye tracking, andthe average correct rate for eye locationandtracking can achieve 99.1%on four test videos. The correct rate for fatigue detection is l00%, but the average precision rate is 88.9%onthetest videos. "Monitoring Driver Fatigue usingFacial Analysis Techniques" In this paper, we describe a non-intrusive vision-based system for the detection of driver fatigue. The system uses a color video camera that pointsdirectly rewards the driver's face and monitorsthe driver's eyes in order to detect micro-sleeps(short periods of sleep). The systemdeals withskin-color information in order to searchfor theface in the input space. After segmentingthepixels with skin like color, we performblobprocessing in order to determine the exact position of the face. We reduce the searchspaceby analyzing the horizontal gradient mapof theface, taking into account the knowledge that eyeregions in the face present a great change inthehorizontal intensity gradient. In order to findandtrack the location of the pupil, we use grayscalemodel matching. We also use the same patternrecognition technique to determine whether theeye is open or closed. If the eyes remainclosedfor an abnormal period of time (5-6 sec), thesystem draws the conclusion that the personisfalling asleep and issues a warning signal.

"The Steps of Proposed Drowsiness DetectionSystem Design based on Image ProcessinginSimulator Driving "

Drowsiness detection has many implicationsincluding reducing roads traffic accidentsimportance. Using image processing techniquesis amongst the new and reliable methods insleepy face. The present pilot study was donetoinvestigate sleepiness and providing imagesofdrivers' face, employing virtual-realitydrivingsimulator. In order to detecting

level ofsleepiness according to the signal, information related to 25 drivers was recorded with imaging rate of 10 fps. Moreover, on average 3000 frames was analysed for each driver. The frames were investigated by transforming in grey scale space and based on the Cascade and Viola & Jones techniques and the images characteristics were extracted using Binary and Histogram methods. The MPL neural network was applied for analysing data.70% of information related to each driver were inserted to the network of which 15% for test and 15% for validation. In the last stage the accuracy of 93% of the outputs were evaluated. The intelligent detection and usage of various criteria in long-term time frame are of the advantages of the present study, comparing to other researches. This is helpful in early detection of sleepiness and prevents the irrecoverable losses

3.IMPLEMENTATION

3.1 Video Recording: Using this module we will connect application to webcam using OPENCV built-in function called VideoCapture.

3.2 Frame Extraction: Using this module we will grab frames from webcam and then extract each picture frame by frame and convert image into 2 dimensional array.

3.3 Face Detection & Facial Landmark Detection: Using SVM algorithm we will detect faces from images and then extract facial expression from the frames.

3.4 Detection: Using this module we will detect eyes and mouth from the face

3.5 Calculate: Using this module we will calculate distance with Euclidean Distance formula to check whether given face distance closer to eye blinks or yawning, if eyes blink for 20 frames continuously and mouth open as yawn then it will alert driver.

3.6 Face Detection Using OpenCV

This seems complex at first but it is very easy. Let me walk you through the entire process and you will feel the same.

Step 1: Considering our prerequisites, we will require an image, to begin with. Later we need to create a cascade classifier which will eventually give us the features of the face.

Step 2: This step involves making use of OpenCV which will read the image and the features file. So at this point, there are NumPy arrays at the primary data points.

All we need to do is to search for the row and column values of the face NumPy N dimensional array. This is the array with the face rectangle coordinates.

Step 3: This final step involves displaying the image with the rectangular face box.

4. SVM DESCRIPTION

Machine learning involves predicting and classifying data and to do so we employ various machine learning algorithms according to the dataset. SVM or Support Vector Machine is a linear model for classification and regression problems. It can solve linear and non-linear problems and work well for many practical problems. The idea of SVM is simple: The algorithm creates a line or a hyperplane which separates the data into classes. In machine learning, the radial basis function kernel, or RBF kernel, is a popular kernel function used in various kernelized learning algorithms. In particular, it is commonly used in support vector machine classification. As a simple example, for a classification task with only two features (like the image above), you can think of a hyperplane as a line that linearly separates and classifies a set of data.

Intuitively, the further from the hyperplane our data points lie, the more confident we are that they have been correctly classified. We therefore want our data points to be as far away from the hyperplane as possible, while still being on the correct side of it.

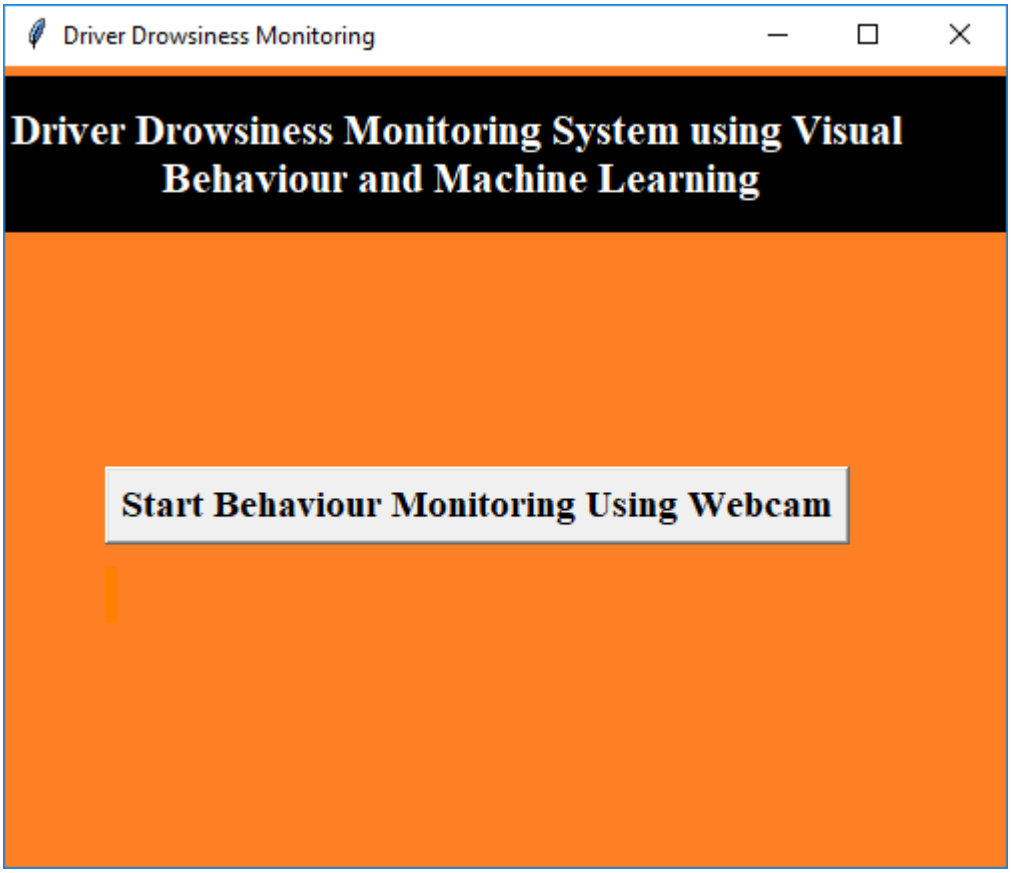
So when new testing data is added, whatever side of the hyperplane it lands will decide the class that we assign to it.

How do we find the right hyperplane?

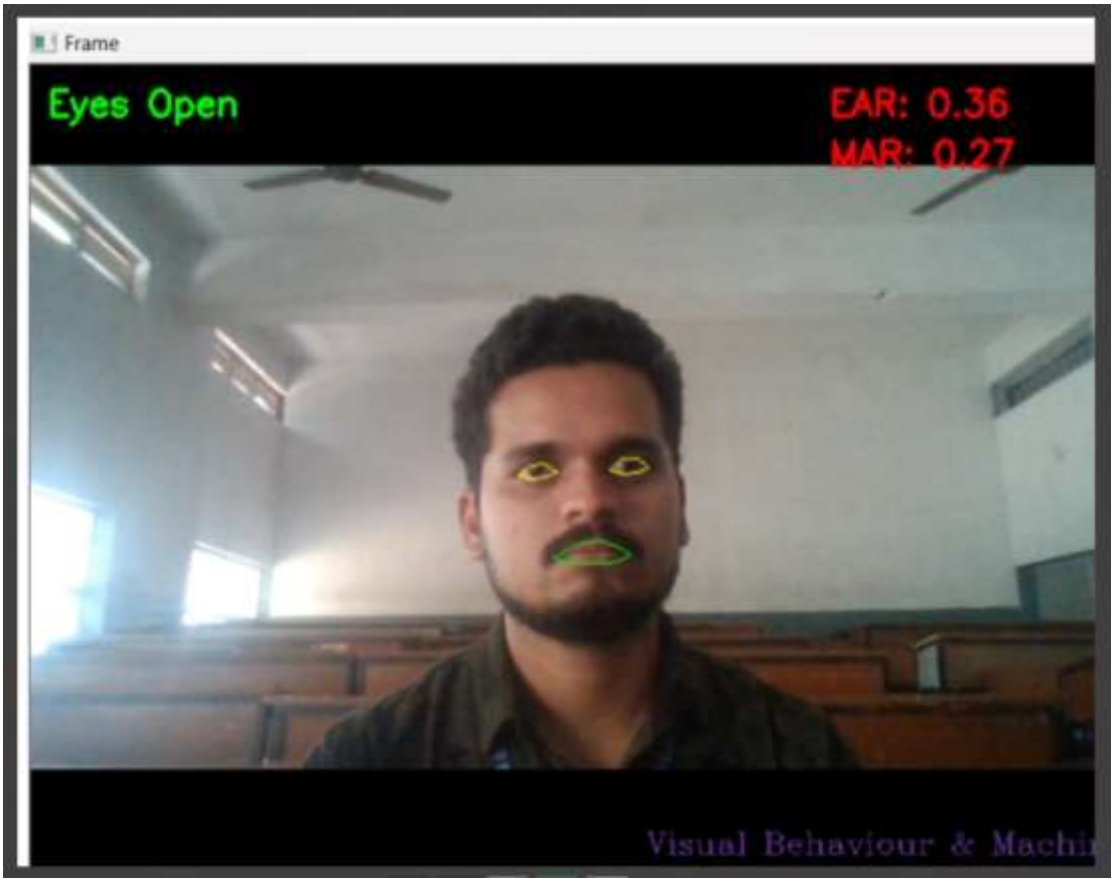
Or, in other words, how do we best segregate the two classes within the data?

The distance between the hyperplane and the nearest data point from either set is known as the margin. The goal is to choose a hyperplane with the greatest possible margin between the hyperplane and any point within the training set, giving a greater chance of new data being classified correctly.

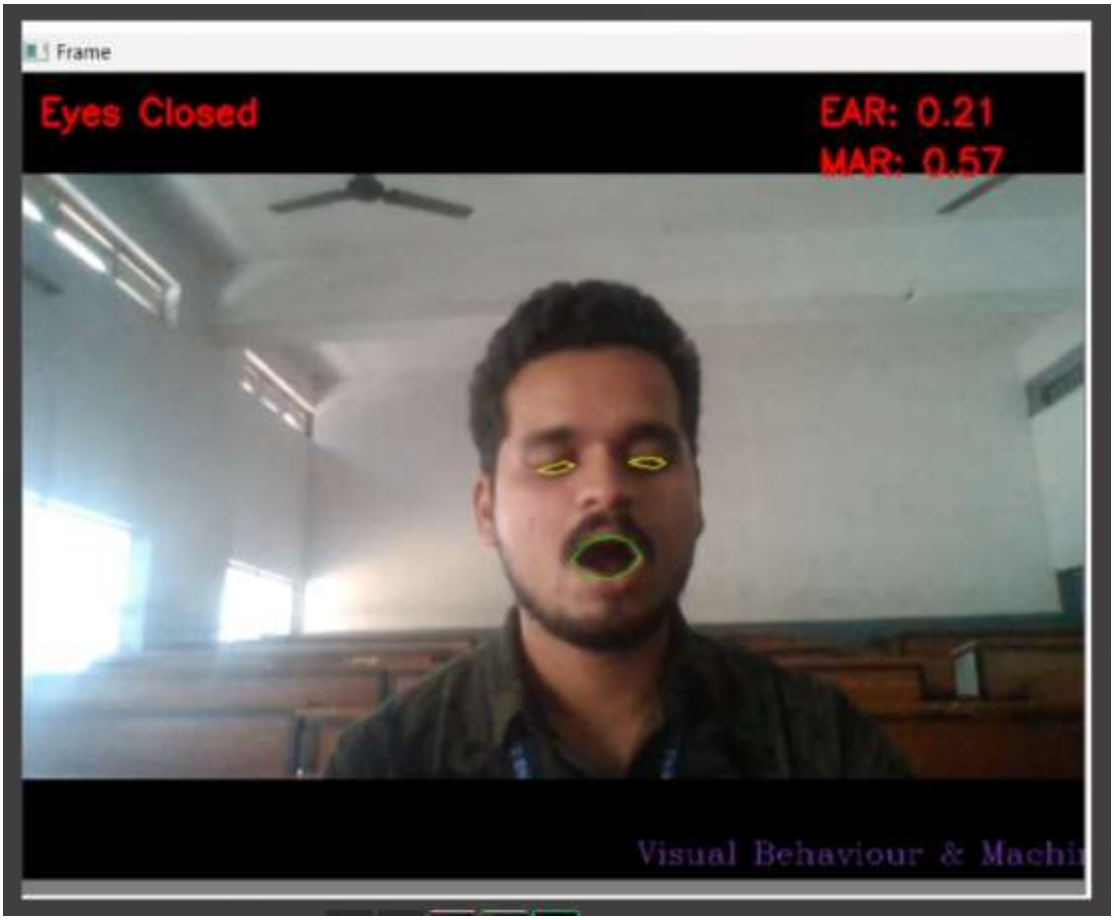
5.RESULTS AND DISCUSSIONS



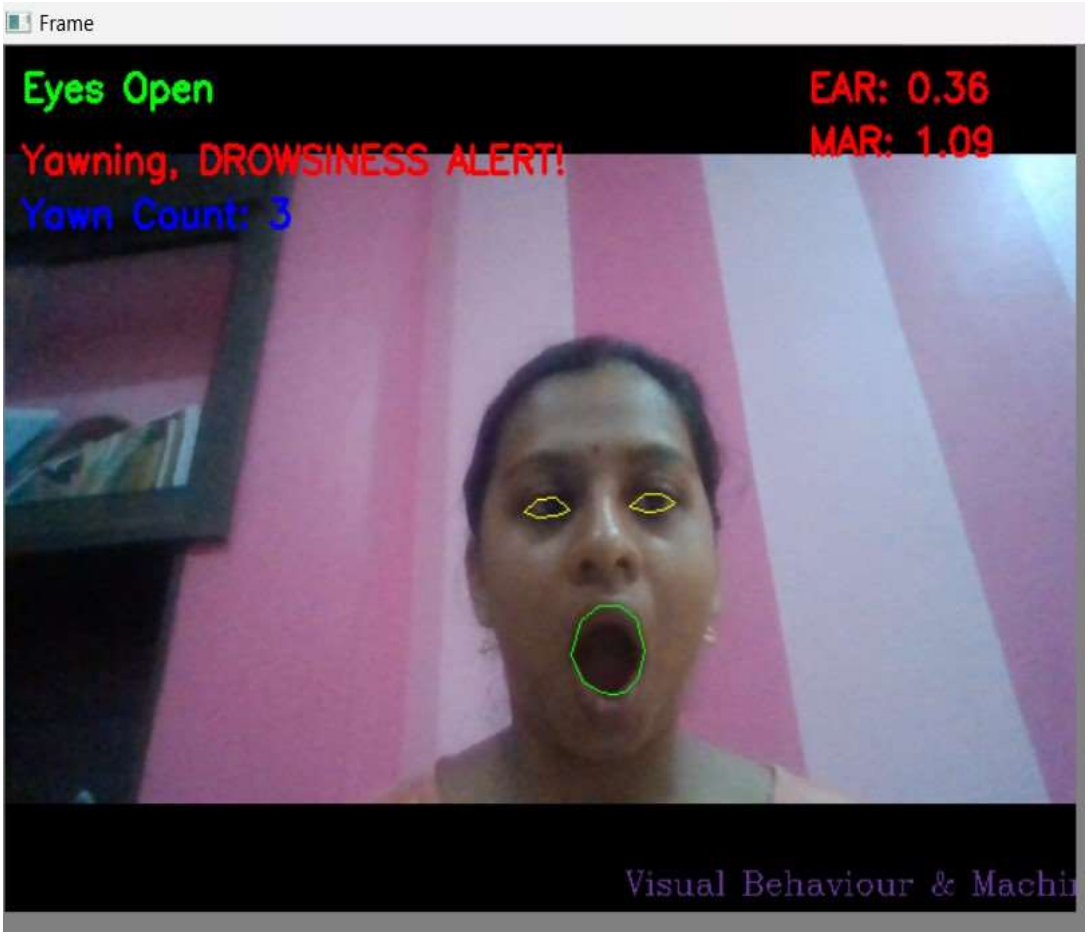
5.1 In above screen click on 'Start Behaviour Monitoring Using Webcam' button to connect application with webcam, after clicking button will get below screen with webcam streaming



5.2 In above screen we can see web cam stream then application monitor all frames to see person eyes are open or not, if closed then will get below message



5.3 Similarly if mouth starts yawn then also will get alert message



5.4 Above application monitor all frames to see person eyes are open or not, if closed then will get below message

6.CONCLUSION

Right now, minimal effort, continuous driver tiredness observing framework has been proposed dependent on visual conduct and AI. Here, visual conduct highlights like eye viewpoint proportion, mouth opening proportion and nose length proportion are figured from the spilling video, caught by a webcam. A versatile thresholding strategy has been created to identify driver languor continuously. The created framework works precisely with the produced engineered information. Thusly, the component esteems are put away and AI calculations have been utilized for order. Bayesian classifier, FLDA and SVM have been investigated here. It has been seen that FLDA and SVM outflank Bayesian classifier.

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