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Driver Drowsiness Detection Using Machine Learning

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Abstract: ***Now-a-days many of the road accidents occurring because of driver drowsiness. It is one of the major causes of vehicle accidents. So, prevention of this fatigue related accidents an intelligent system is need to be developed. The main idea of this project is to develop a robust system that will detects the driver fatigue and alerts the driver and saves the lives. In this project, we present a scheme for drowsiness detection. In this model, driver is continuously monitored through webcam or camera. And we used OpenCV for extracting the driver face from continuous image frames of the camera. This model mainly focuses on the Region of interest (ROI) i.e., eyes as it is the important factor to detect drowsiness. We used an algorithm to track and analyze the blinking rate of the eyes. If the eyes are closed in more than two frames then model will detect as driver is drowsy and alerts the driver by playing alarm sound.***

Keywords: Drowsiness, Fatigue, OpenCV, ROI.

I. INTRODUCTION

For a better standard of living, development of technology allowing us to introduce more advanced solutions. Drowsiness is a state near to sleep, where the person has strong desire for sleep. Drowsiness is dangerous in some cases where there is a need of constant concentration while performing tasks like driving a vehicle. When a driver has sufficient fatigue then it causes drowsiness and it leads to road accidents. According to latest statistics about 21 percent of fatal accidents are because of driver driving with drowsy. As per the estimates of National Highway Traffic Safety Administration (NHTSA) every year 100,000 road accidents are driver fatigue related. All latest statistics are suggesting that fatigue related accidents increasing every day. Fatigue related accidents are occurring because of driver tiredness, lack of concentration and other climate conditions.

The development of technology for drowsiness detection and accident prevention is a major challenge. The main object of this project is to develop a simulation of driver drowsiness detection system. The developed model mainly focuses on the open and closed state of the eyes. This model will continuously monitor the driver eyes and detects drowsiness at very early stage and avoid the road accident. Drowsiness detection involves analyzing of multiple image frames of face, and the observation of eyes using an algorithm. If the eyes are closed then score will increases after it reaches threshold value then the model alerts the driver by playing alarm sound.

II. LITERATURE SURVEY

Several experiments have been carried out over the years by different groups of researchers. Here are some of the following groups:

[1] Yaman Albadawi, Maen Takruri, Mohammed Awad has proposed a Review of Recent Developments In Driver Drowsiness Detection Systems. This paper has presented a detailed and up-to-date review of the driver drowsiness detection systems that have been implemented in the last ten years. It has described the four main approaches followed in designing DDD systems and categorized them based on the type of drowsiness indicative parameters employed. These four categories are image-, biological-, vehicle-, and hybrid-based systems. The paper has provided a detailed description of all the presented systems, in terms of the used features, implemented AI algorithms, and datasets used, as well as the resulting system accuracy, sensitivity, and precision.

[2] Vasundhara Iyer, Atharv Vanjari, Varun Patil, Varad Ingale, Varun Gujarathi, Yogeshwari Rathod has proposed Driver Drowsiness Detection System. In this face detector was constructed, which is based on the Histogram of Oriented Gradients (HOG). The quantitative metric used in the proposed algorithm was the Eye Aspect Ratio (EAR) to monitor the Driver Drowsiness. The average real-time test accuracies obtained using Dlib for Eye Detection Accuracy was found to be 80.17% and Drowsiness Accuracy as found to be 78.50%. The results of real-time detection are lower as the model currently works well under good lighting conditions.

[3] Venkata Rami Reddy Chirra, Srinivasulu Reddy Uyyala, Venkata Krishna Kishore Kolli has proposed Deep CNN: A Machine Learning Approach Driver Drowsiness Detection based on eye state.

This determines the state of the eye that is drowsy or non- drowsy and alert with an alarm when state of the eye is drowsy. Face and eye region are detected using Viola-Jones detection algorithm. Stacked deep convolution neural network is developed to extract features and used for learning phase. A SoftMax layer in CNN classifier is used to classify the driver as sleep or non-sleep. Proposed system achieved 96.42% accuracy

III. PROPOSED SYSTEM

Our proposed system is driver drowsiness detection using machine learning which is a car safety technology that detects the driver fatigue and alerts the driver using alarm sound. It uses OpenCV for extracting face and Region of Interest (ROI) i.e., eyes from the sequence of images from webcam.

We used an algorithm called Eye Aspect Ratio (EAR) to the proposed model. Model provides landmarks to the both the eyes and then by using the algorithm EAR model predicts whether the eyes or opened or closed.

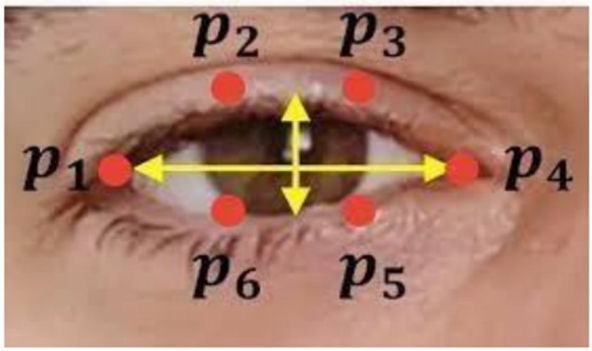

Figure.3.1 Eye coordinates

EAR consists numerator as distance between upper lid and lower lid of eye and denominator of EAR consists distance from left to right corner of the eye, by calculating the EAR ratio for both left and right eye then it takes the average EAR of the both the eyes then in the next step compare with the threshold value of the EAR i.e.., 0.25. If the EAR is greater than the threshold value then the system alerts driver by ringing the alarm sound else if EAR less than threshold value then again start monitoring the driver through webcam such that, this proposed system will help in preventing the fatigue related road accidents.

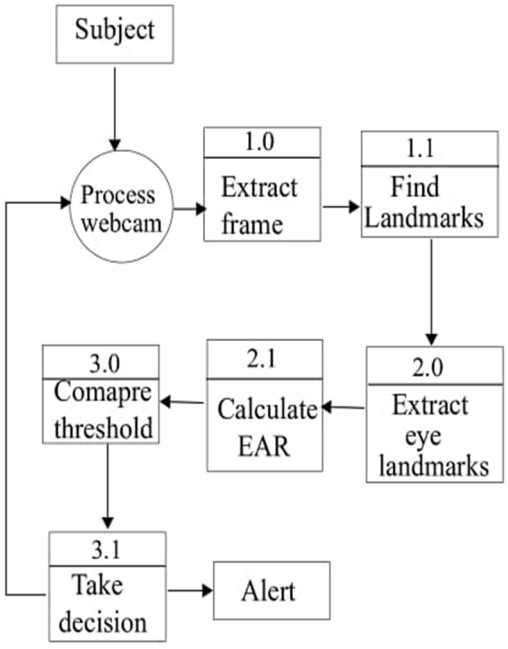

Figure.3.2 Architecture of the Model

IV. RESULT

Feeding real-world images into the proposed model is important to test the effectiveness of the model. Correct predictions indicate that the model is reliably integrated with designing a real-world application for classifying facial recognition and drowsiness detection.

In this proposed model, a performance accuracy of around 90-95% was achieved by using the Machine Learning techniques, and by using Eye Aspect Ratio (EAR).

This indicates that the proposed model of this experiment is highly effective and provides accurate results.

The result of the Driver Drowsiness detection is shown in the figures below-

Figure.4.1 Eyes Opened

The model detected as Eyes are Open and score is zero, it indicates driver is not fatigue.

Figure.4.2 Eyes Closed

The model detected as Eyes are closed but score is less than threshold value. Alarm plays when score exceeds threshold value.

Figure.4.3 Eyes Closed and drowsiness detected

The Model detects driver is Drowsy and Score is maximum than threshold value so, plays an Alarm Sound.

Fig 2,3,4 Show the real time test case generating a score based on the time the eyes were closed and sounding an alarm when reaching certain threshold.

V. CONCLUSION

The project has been developed in a efficient way for detecting drowsiness and alerting driver using the alarm sound to prevent the road accidents. In this, we have trained a model for Drowsiness detection using OpenCV, Kera's, NumPy, Pygame and used Eye Aspect Ratio (EAR) algorithm. With the help of OpenCV we were able to capture the video feed from different sources like webcam, video file. And detect whether a person is drowsy or not.

The model results show a high accuracy rate in identifying whether the driver is drowsy and not. The model was able to achieve around 90-95% of performance accuracy, which is a significant achievement. Moreover, this model is also useful in whereas other drowsy detection applications like in Military, Factories, Offices, Railways etc.

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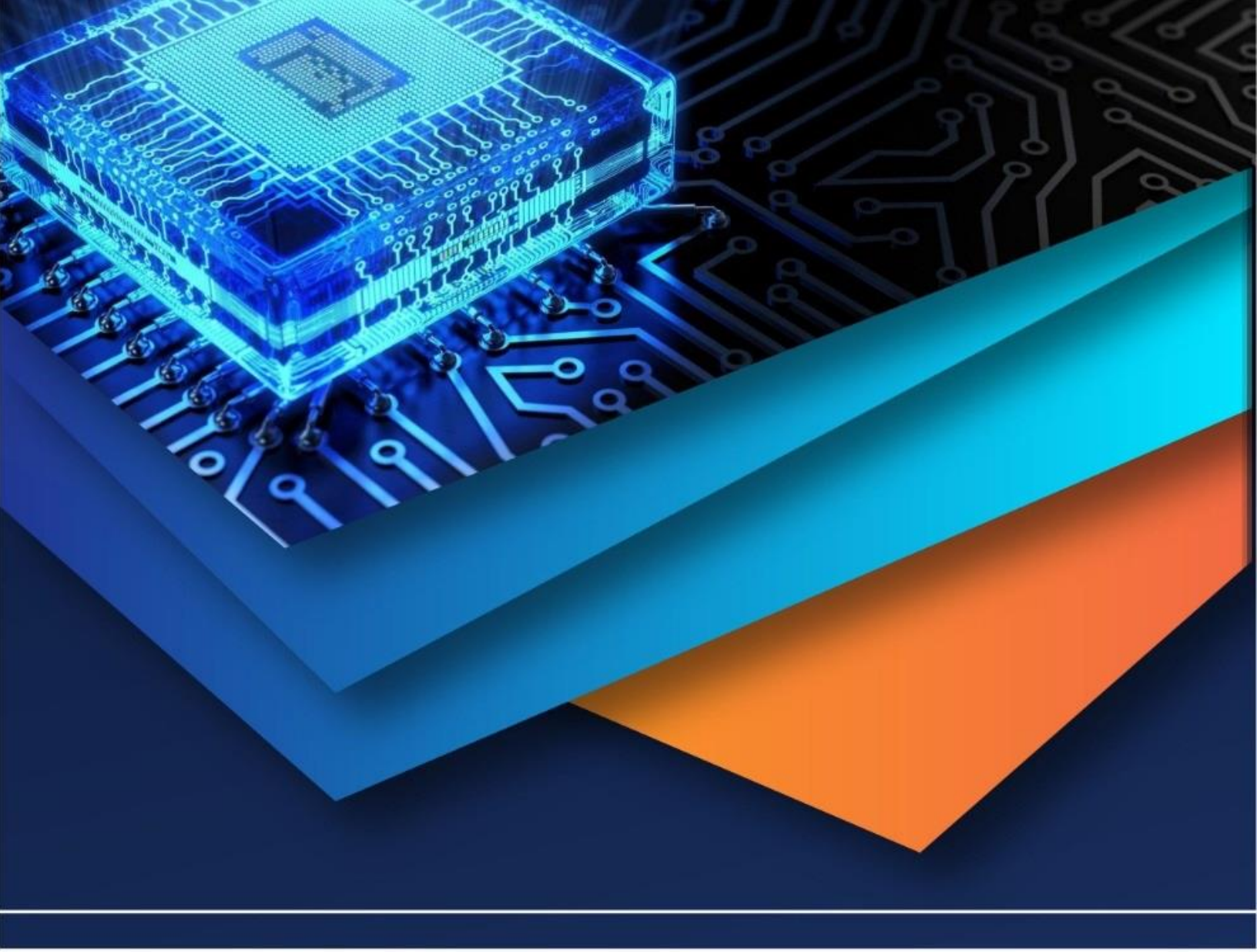

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