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Implementation towards Drowsiness Detection

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ABSTRACT: Nowadays, a countless number of people tend to use different types of transportation for travelling from one place to another either through land, air or water. It is very dangerous to drive when you feel asleep. Long-distance drivers suffer from insomnia. The drivers should be very cautious while driving and even he/she have to be very careful while driving at night time. Driver's drowsiness is the real cause of many road accidents. Therefore, there is a necessity for developing a deep learning model that will detect and notify a driver's condition. The system proposes detection of drowsiness for driver. Generally, road accidents causes by fatigue Driver fatigue is a very serious problem causing in many thousands of road accidents each year. It is not possible to calculate the exact number of accidents because of drowsiness but research shows 20% of accidents happens only because of fatigue. The system provides Camera for Eye-Blink Monitoring System, provide buzzer and implement system through Deep Learning Model.

KEYWORDS: drowsiness detection, driver fatigue, deep learning model, camera.

I. INTRODUCTION

Drowsiness or fatigue is one of the main factors that threaten the road safety and causes the severe injuries, deaths and economical losses. The increased drowsiness deteriorates the driving performance. Lack of alertness, generated by the unconscious transition from wakefulness to sleep, leads to several serious road accidents. The U. S. National Highway Traffic Safety Administration (NHTSA) reports that drowsy driving resulted in almost 100,000 road accidents and more than 1,500 deaths per year. A driver's fatigue can have multiple causes such as lack of sleep, long journey, restlessness, alcohol consumption and mental pressure. Each of which can lead to serious disaster. Nowadays, road rage is in the multiples of the past, which causes stress on drivers. Therefore, previous transportation system is not enough to handle these hazards on roads. Thus, by embedding the auto matic fatigue detection systems into vehicles, several deadly accidents can be prevented. The drowsiness detection system continuously analyzes the drivers' attention level and alerts the driver before the arrival of any serious threat to road safety.

Due to the hazards that fatigue create on the roads, researchers have developed various methods to detect driver drowsiness and each technique has its own benefits and limitations. To conduct a valuable review of Drowsiness Detection Techniques (DDT) and appropriate classification methods, we build search strings to gather relevant information. We keep our search focused on publications of well reputed journals and conferences. We established a multi-stage selection criteria and assessment procedure.

In this System, the Driver Drowsiness Monitoring System is presented in order to reduce the number of accidents caused by driver fatigue and thus improve road safety. This system treats the automatic detection of driver drowsiness based on visual information and deep learning. Also this system helpful for identification of the driver. Driver identification in a car system refers to the process of verifying the identity of the person driving the car. This technology is becoming increasingly popular and is being used in various applications such as car sharing services, fleet management, and personal car security. Once the driver's identity is verified, the car system starts the live capturing of that driver's face for driver's drowsiness detection. We locate, track and analyze the driver face, mouth and eyes and check whether the driver is drowsy.

Paper is organized as follows. Section II describes about the related work done earlier for the system to be developed. Section III presents method used and algorithms used for the detection. Section IV presents experimental results showing results of images tested. Finally, Section V presents conclusion.

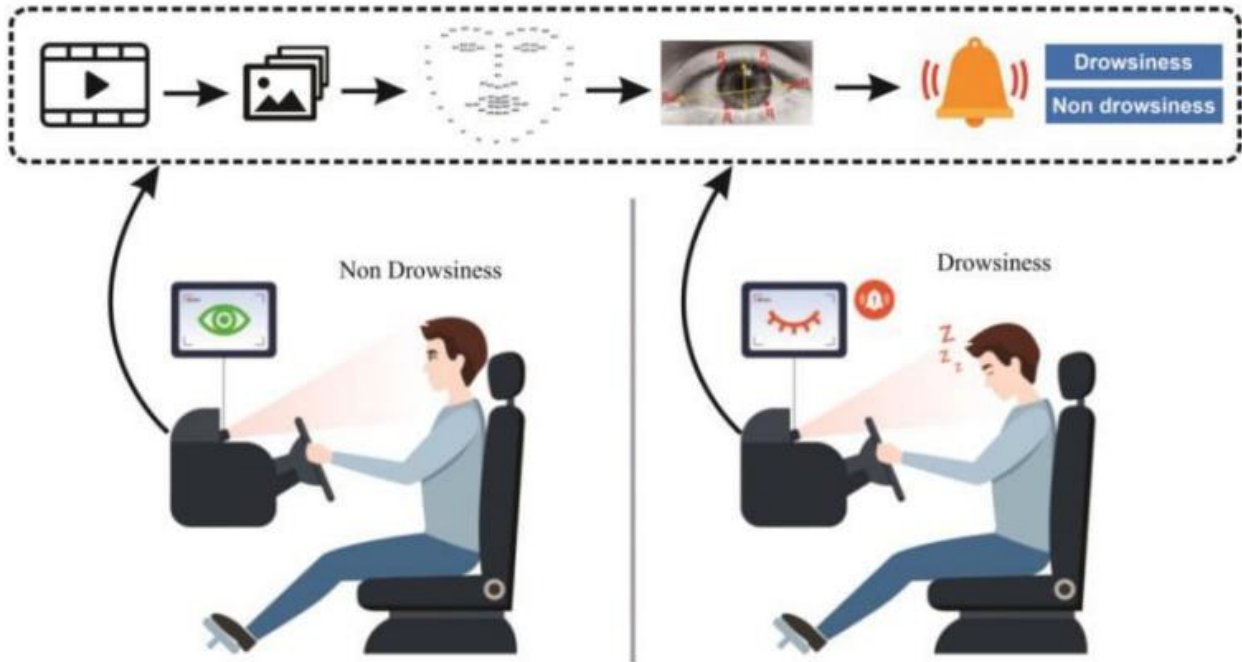


Figure 1: GENERAL MODEL OF A DROWSY DETECTION SYSTEM

SCOPE

Driver drowsiness detection systems using deep learning have a broad scope, as they can be used in various applications to improve safety and prevent accidents caused by drowsy driving. These systems can detect the driver's level of alertness by analyzing their facial expressions, eye movements, head position, and other physiological signals.

1. **Transportation safety:** Drowsy driving is a leading cause of road accidents, particularly in long-distance driving, trucking, and transportation industries. A drowsiness detection system can alert drivers when they are becoming drowsy or inattentive, helping to prevent accidents and improve overall transportation safety.
2. **Automotive industry:** Automotive manufacturers are incorporating drowsiness detection systems in their vehicles to improve safety. These systems can alert drivers with visual or audio warnings, or even automatically slow down or stop the vehicle if the driver becomes too drowsy or unresponsive.
3. **Fleet management:** Companies with large vehicle fleets, such as taxi and delivery services, can benefit from drowsiness detection systems. These systems can help reduce the risk of accidents and improve overall driver performance and efficiency.
4. **Personal safety:** A driver drowsiness detection system can also be used in personal vehicles to improve safety for drivers and passengers. It can alert drivers when they are becoming drowsy or inattentive, reducing the risk of accidents caused by fatigue.

II. RELATED WORK

1) Driver Drowsiness and Distraction Detection using Machine Learning

This project uses the technology of OpenCV (Computer Vision) powered by Machine Learning in order to detect the eyes, head and mouth movements while driving. One of the best ways to detect a drowsy driver is to use a vision-based approach. Technique used are Detecting Face and Eye part, Detecting Head for distraction, Detecting Yawning mouth. Advantages are Detecting Drowsiness and Distraction. Disadvantages are The development of such systems encounters many difficulties associated with the fast and accurate recognition of the driver's drowsiness symptoms.

2) Driver Drowsiness Detection System for Vehicles

The detection of drowsiness, the most relevant visual indicators that reflect the driver's condition are the behavior of the eyes, the lateral and frontal assent of the head and the yawn. Technique used are Behaviour of Eyes with Eigen Value, Lateral And Frontal assent of Head, Detection Of Yawn. Advantages are The system works adequately under natural lighting conditions and no matter the use of driver accessories like glasses, hearing aids or a cap.

3) Automatic classification methods for detecting drowsiness using wavelet packet transform extracted time-domain features from single-channel EEG

Single-channel EEG based drowsiness detection (DD) model is proposed in this by utilizing wavelet packet transform (WPT) to extract the time-domain features from considered channel EEG. The dimension of the feature vector is reduced by the proposed novel feature selection method. Technique used are EEG. Advantages are Time-domain features obtained from EEG time-domain sub-bands collected using WPT achieving excellent accuracy rate by selecting unique optimization features for all subjects by the proposed feature selection algorithm.

4) Advanced Driver Assistance System for the drowsiness detection using facial landmarks

Advanced driver assistance systems ADAS help reduce these serious human errors. Detection of Facial landmarks with help of Algorithm Viola & Jones Paulo and methodology of Haar cascade is Implemented for system. Technique used Facial Landmark Detection by Haarcascade.

5) Driver Drowsiness Detection

First Driver face is captured and eye retina detection and facial feature extraction are done and blinking values are calculated then threshold values are set. Secondly, the Arduino module is used which is integrated with elastomeric sensors for real-time calculation of driver hand pressure on the car steering wheel and the threshold value is set. Techniques used for face Detection is HOG which does Eye Blinking Calculation

III. METHODOLOGY

In this System, the Driver Drowsiness Monitoring System is presented in order to reduce the number of accidents caused by driver fatigue and thus improve road safety. This system also identifies the driver face. Once the driver's identity is verified, the car system starts the live capturing of that driver's face for driver drowsiness detection. This system treats the automatic detection of driver drowsiness based on visual information and deep learning. We locate, track and analyze the driver face, mouth and eyes and check whether the driver is drowsy.

Description:

The system work flow is explained as follows:

1. Face Detection : Face is detected through the video stream.
2. Face Identification : New driver's face is verified and added in system through registration given by system.
3. Feature Extraction : Facial features and eyes features are extracted
4. Classification : The eyes are classified as open eyes or closed eyes.
5. Drowsiness Detection : If the eyes are closed driver is drowsy

System Architecture:

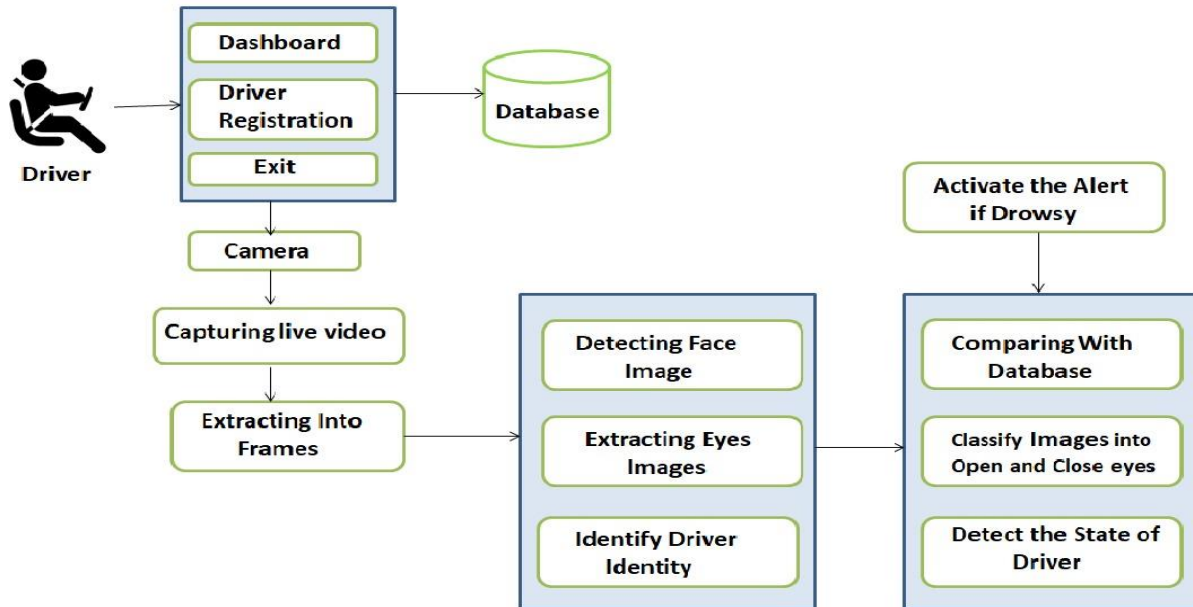


Figure 2: SYSTEM ARCHITECTURE

Modules:

1. Face Detection

- Face Detection module. Locate one or more faces in the image and mark with a box having border.
- Face Alignment. Normalize face to be consistent with the existing database, such that as geometry and photometrics.
- Feature Extraction. Extract features from the face one by one than that can be used for recognition of task.
- Face Recognition. Perform matching of the face one with others and match it in database.

2. Eye Position and Open Mouth Detection

- The eyes are detected in image.
- The open eyes are detected.
- The close eyes are detected.
- The eyes ratio is calculated.
- The open mouth is detected.

3. Drowsiness Detection

- Calculation of eyes id determined.
- Calculation of open Mouth is determined.
- If all above is true, Drowsiness is detected.

4. Face Identification

- New driver's face is verify and added in system through registration given by system.
- New registered face added to database.
- Thus new driver's face is verified identified by system.

Algorithm CNN:

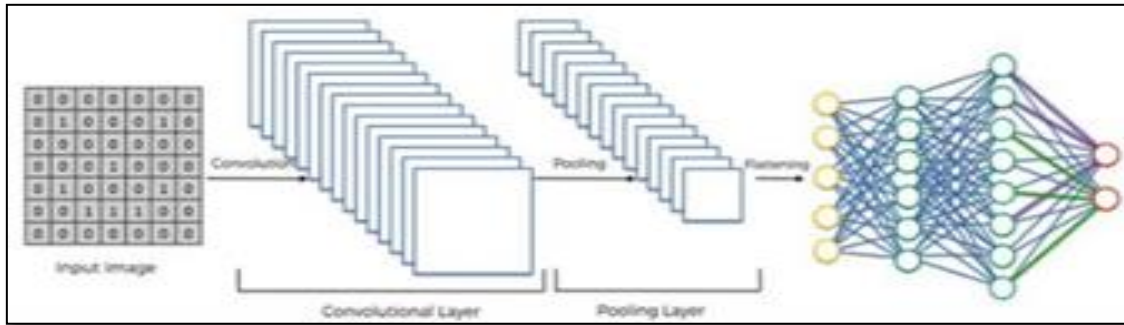


Figure 3: CNN ALGORITHM

- Step 1: Dataset containing images along with reference caption is fed into the system
- Step 2: The convolutional neural network is used as an encoder which extracts image features 'f' pixel by pixel.
- Step 3: Matrix factorization is performed on the extracted pixels. The matrix is of $m \times n$.
- Step 4: Max pooling is performed on this matrix where the maximum value is selected and again fixed into matrix.
- Step 5: Normalization is performed where every negative value is converted to zero.
- Step 6: To convert values to zero rectified linear units are used where each value is filtered and negative value is set to zero.
- Step 7: The hidden layers take the input values from the visible layers and assign the weights after calculating maximum probability.

IV. EXPERIMENTAL RESULTS

Figures show the results of drowsiness detection with a score of 1 to 10 and open or closed. Fig 3 shows the drowsiness detection with open eyes. Fig 4 shows with closed eyes and score mentioned. Figure 5 shows how the drowsiness is detected even with spectacles.

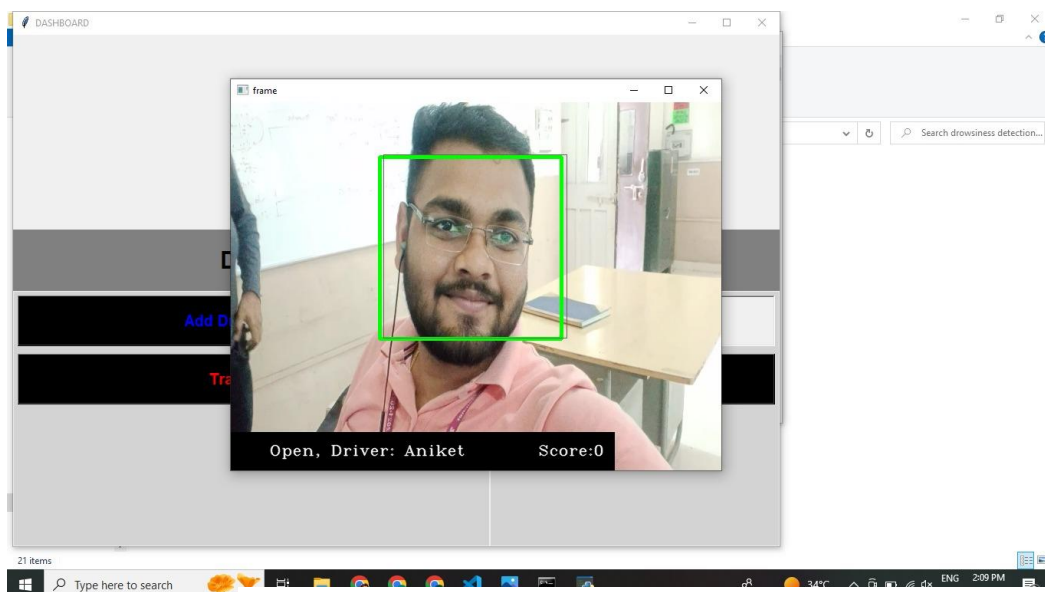


Figure 4 : Identification of Driver with open eyes

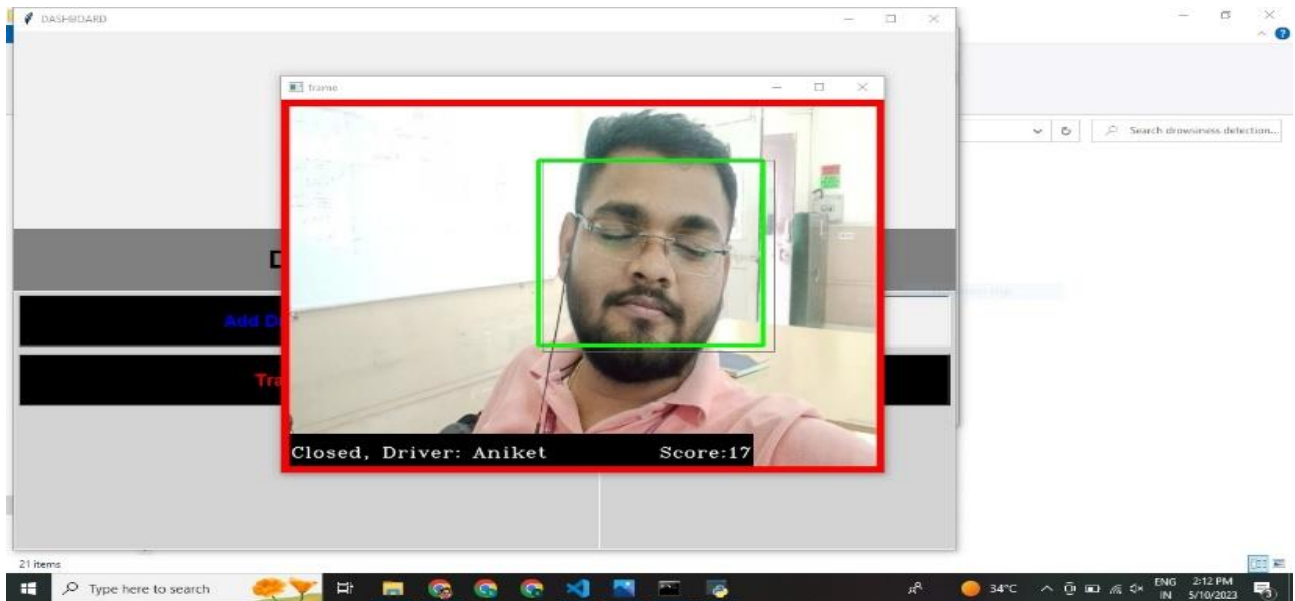


Figure 5: Close Eyes Detected With Spect

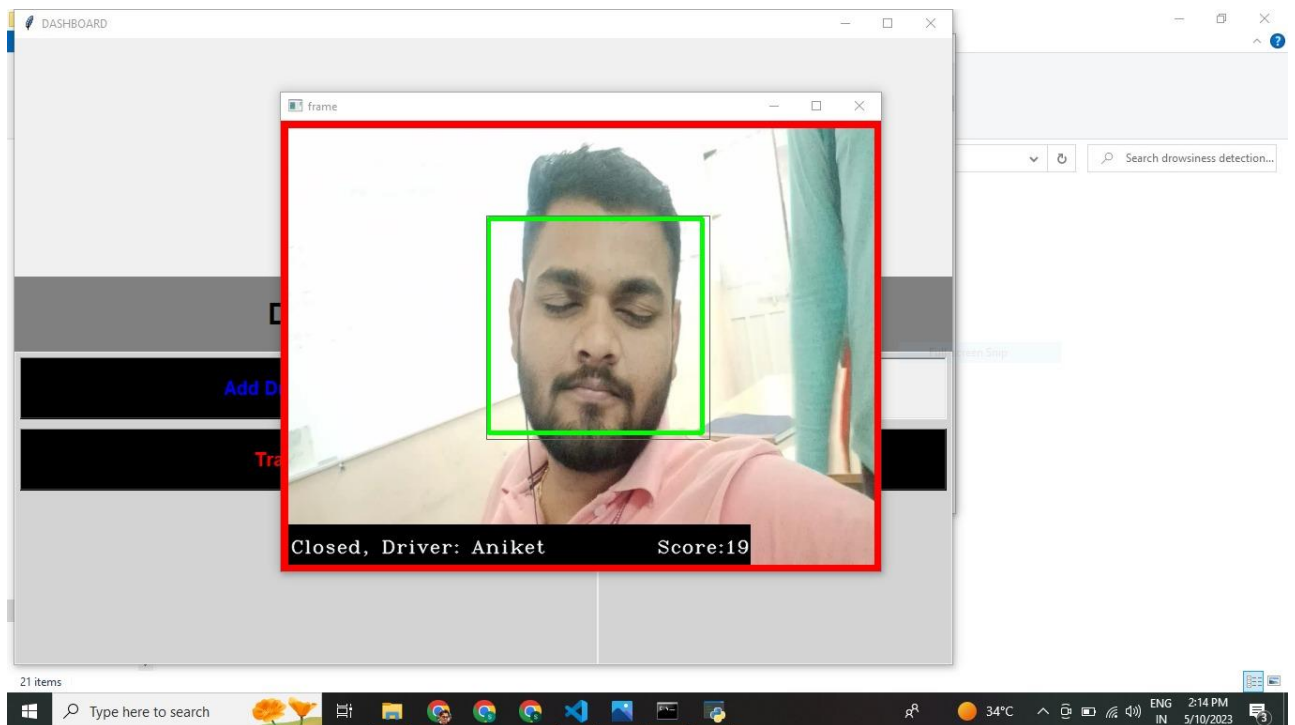


Figure 6 : Close Eyes Detected

V. CONCLUSION

Designing a system that can detect the drowsiness driver from prevent the accident, detect drunk driver. This project is made with pre-planning, that it provides flexibility in operation. This innovation has made more desirable and

economical. This project is designed with the hope that it is very much economical and helpful for driver and as well as conductors and passenger during journey.

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