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Real-Time Driver Drowsiness Detection System

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Abstract - Deep learning techniques have been used to predict a driver's condition and emotion in order to provide information that will improve road safety. It is an example of artificial intelligence in action. emotion of a driver and to deliver information. It uses artificial intelligence in some way. An intelligence system has been developed to detect the driver's drowsiness, preventing accidents and reducing losses and sufferings Bio-indicators, driving behavior, and facial expressions can all be used to estimate a driver's condition. In this paper, we present a comprehensive review of recent works on driver drowsiness detection and alert systems. We also discuss various deep learning techniques, such as CNN, which is specifically designed to work with images and videos, HAAR-based cascade classifiers, and OpenCV, which are used to determine the driver's condition. Finally, we identify the challenges that the current system faces and how it can be improved in the future for vehicles.

Key Words: Artificial Intelligence, CNN (Convolutional Neural Network), Drowsiness Detection, Deep Learning are some key terms

1. INTRODUCTION

Driver drowsiness is said to be one of the most common causes of road accidents. Drowsiness exposes drivers to higher crash risks, severe physical injuries, or even death, while the economic losses are not insignificant. A drowsy driver is in a state of extreme mental and physical flabbiness, resulting in decreased mental alertness and a feeling of tiredness. He is not competent to perform a safe driving manoeuvre while in this state. Drowsy driving could be a serious issue in our society because it affects and endangers all traffic participants, including drivers and pedestrians. The implementation of a system that monitors the driver's level of drowsiness in real time will reduce the number of car accidents and save countless lives around the world. The use of such an assisting system, capable of measuring the level of vigilance, is critical in the prevention of car accidents. It is critical to understand the extent of drowsiness in order to develop the system. Four types of measurements are commonly used to assess drowsiness. face detection employs a variety of approaches. Several of these encode knowledge about typical face characteristics and find structural elements - such as brows, eyes, nose, mouth, and hairline - and use the relationships between them to detect faces. Supported segmentation was proposed in a very method to spot the face from a cluttered background. The eclipse will be detect, because it was fitted to the boundary between the top region and the background. Human colouring and texture faces have also been shown to be useful for face detection. The colour that will be separated from other parts of the background was the most important feature for this method. The maximum varieties variance threshold was used in this method. Another technique used for face detection was histogram intersection within the HSV colour space to highlight the skin region. The template matching methods store several patterns of various faces to explain as a full or the face expression separately, by computing the correlations between an input image and also the stored pattern to work out the degree of similarity of the pattern to a face. This method employs a number of techniques. We use the CNN algorithm to extract features from image screens to detect features on the face. We can determine the Drowsiness level of the motive force by detecting the features of eyes in the image, whether they are closed or open.

2. LITERATURE REVIEW

Driver drowsiness is said to be one of the most common causes of road accidents. Drowsiness exposes drivers to higher crash risks, severe physical injuries, or even death, while the economic losses are not insignificant. A drowsy driver is in a state of extreme mental and physical flabbiness, resulting in decreased mental alertness and a feeling of tiredness. He is not competent to perform a safe driving manoeuvre while in this state. Drowsy driving could be a serious issue in our society because it affects and endangers all traffic participants, including drivers and pedestrians. The implementation of a system that monitors the driver's level of drowsiness in real time will reduce the number of car accidents and save countless lives around the world. The use of such an assisting system, capable of measuring the level of vigilance, is critical in the prevention of car accidents. It is critical to understand the extent of drowsiness in order to develop the system. Four types of measurements are commonly used to assess drowsiness. face detection employs a variety of approaches. Several of these encode knowledge about typical face characteristics and find structural elements - such as brows, eyes, nose, mouth, and hairline - and use the relationships between them to detect faces. Supported segmentation was proposed in a very method to spot the face from a cluttered background. The eclipse will be detect, because it was fitted to the boundary between the top region and the background. Human colouring and texture faces have also been shown to be useful for face detection. The colour that will be separated from other parts of the background was the most important feature for this method. The maximum varieties variance threshold was used in this method. Another technique used for face detection was histogram intersection within the HSV colour space to highlight the skin region. The template matching methods store several patterns of various faces to explain as a full or the face expression separately, by computing the correlations between an input image and also the stored pattern to work out the degree of similarity of the pattern to a face. This method employs a number of techniques. We use the CNN algorithm to extract features from image screens to detect features on the face. We can determine the Drowsiness level of the motive force by detecting the features of eyes in the image, whether they are closed or open.

3. OBJECTIVE

The system's main goal is to detect drowsiness supported eyelid movement in a driver and provide an appropriate voice alert in real-time. The opposite goals include developing a system that detects driver drowsiness by regularly monitoring the motive force's eyes, particularly the retina. When the driver's eyes are closed for several seconds, the system should alert the driver. Even when the driver is wearing spectacles, the system performs better. The system will sound an alert for a set period of time until the fatigued driver's eyes are open normally and without drowsiness. This technique is unaffected by poor lighting.

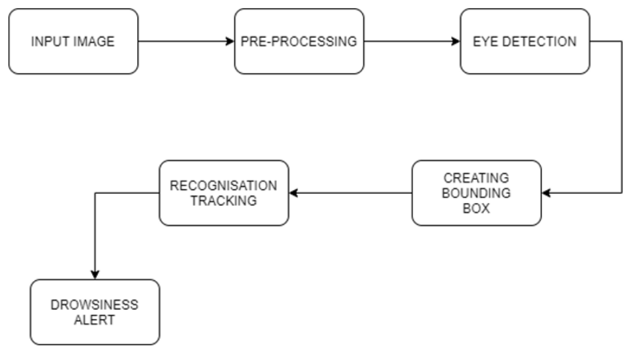
4.METHDOLOGY

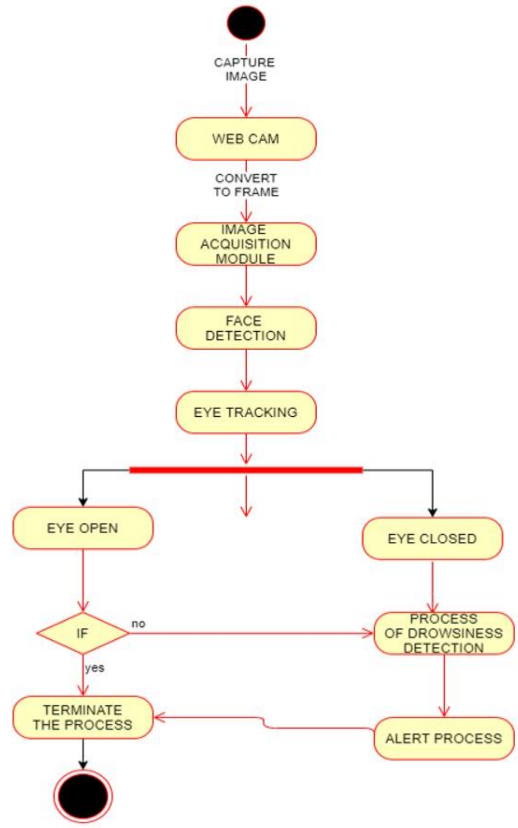
First, using facial landmark detection, the face is located in the image. Then, to detect important features on the face, shape prediction methods are used. Face detection is performed by pre-trained HAAR cascades. to wake the drivers up from their slumber. The following step is to estimate the location of (x, y)-coordinates that correspond to facial structures. My model file was trained on CNN, so the best weights for the model are already known. The CNN is made up of a fully connected layer of 128 nodes. OpenCV was used to collect images from the camera and introduce them into a profound learning model that will classify if the person's eyes are open or closed. Then, as an alert sound, an alarm is used.

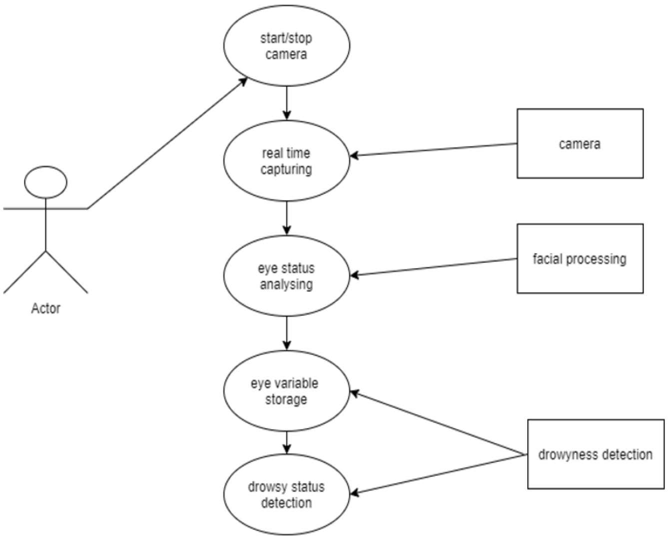
5.SYSTEM DESIGN

5.1 System Architecture

When the driver is driving, the camera captures his or her face, which is then converted into frames. The system then assesses the level of drowsiness and fatigue. The detected facial image is processed to determine whether the driver's eyes are 'Open' or 'Closed'. The alarm will sound if the eyes are opened. If the eyes are closed for a certain period of time, the score is calculated. If the score is higher than the limit, an alarm will sound to alert the fatigued driver until the driver's eye is opened for a certain period of time. When the driver moves away from the fatigue for a short period of time, the alert sound will automatically stop.







5.2Detailed Design

The driver's eyes and mouth are always monitored by the camera attached to the vehicle's dashboard, and if the predefined levels of alertness are observed to be defaulted and compromised, an appropriate alarm is set off, and appropriate action is taken to prevent any fatalities. Figure 4 depicts the Driver Drowsiness System Design. It can be seen that the camera is used to continuously monitor the driver's face, and when drowsiness or fatigue is detected, the system in the dashboard generates an alert sound until the driver awakens from the drowsiness.

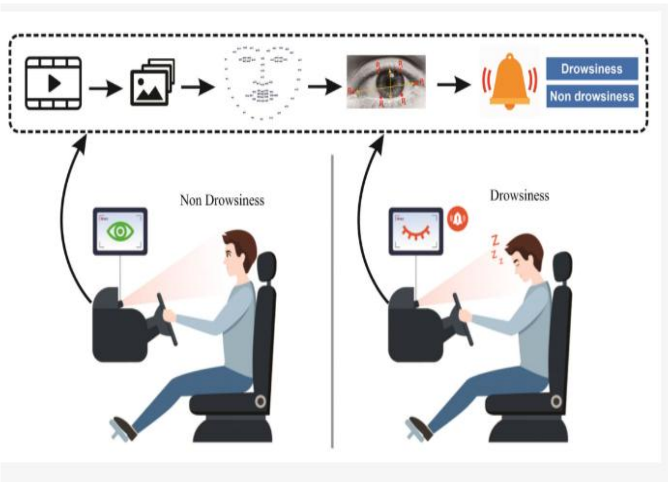


Fig: System Activity

6.EXPERIMENTAL RESULTS

6.1Experimental Dataset

Because the experimental dataset in our project is a CNN trained model, the best weights for the model have already been determined. We wrote a script to collect the images from the camera and then labelled them as 'Open' or 'Closed'. The data was checked, and any images that were not required to build the model were removed. The data set contains approximately 7000 images of people's eyes in various lighting conditions. The dataset includes a wide range of identities, face sizes, lighting conditions, poses, and so on. The dataset includes a wide range of identities, face sizes, lighting conditions, poses, and so on. After training, the model architecture file "models/cnnCat2.h5" is attached.

6.2 Performance Analysis

To achieve the desired results, a large number of photographs were taken. Figure 5 depicts the output when the eyes are opened. The score will also remain zero, and no alarm will sound. Figure 6 depicts the output when the driver's eyes are closed and he or she is fatigued for a period of time. The time taken will be deducted from the score. If the score exceeds a certain threshold, an alarm sound will be generated to alert the driver, allowing him to awaken from his slumber.

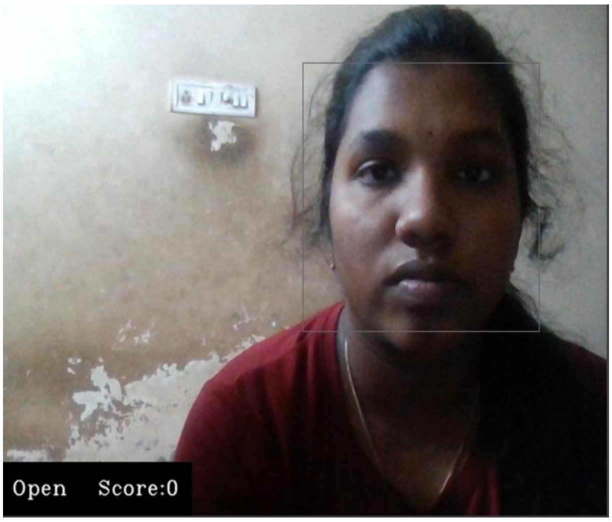


Fig: The driver's eyes are open and in a normal state.

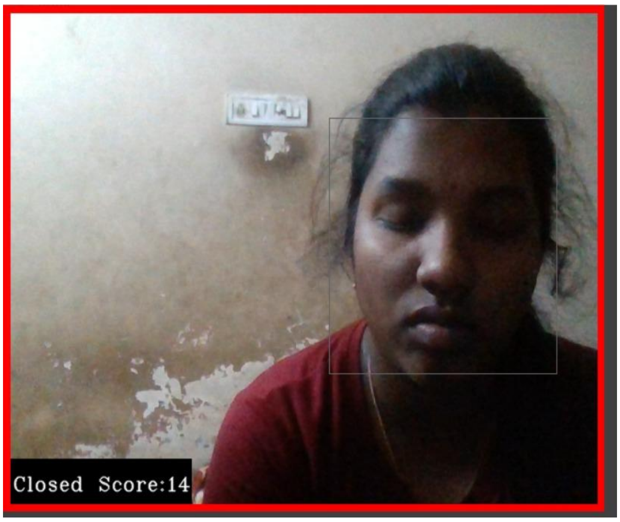


Fig: The driver's eyes are closed and he is tired.

7. CHALLENGES

The model's accuracy suffers if the attention frames are not captured clearly due to any distractions such as goggles, sunglasses, or spectacles (having reflection). In conducting experiments, camera operations such as auto adjustments for zoom and rotation are not taken into account. When the eyes are restricted in position, zooming the camera will help to improve accuracy. When the motive force is not facing the camera, the accuracy of detecting eyes and mouth decreases.

8. FUTURE ENHANCEMENT

Other parameters such as blink rate, yawning, car state, and so on are used to incrementally improve the model. If these parameters are used, the accuracy can be greatly improved. We intend to expand on the project by adding a sensor to track the heart rate in order to prevent accidents caused by sudden heart attacks in drivers. The same model and techniques can be used for a variety of other purposes, such as detecting when a user is sleeping and stopping the video accordingly. It can even be used in an application that prevents the user from sleeping.

9. CONCLUSIONS

This project shows a prototype that has been small-scaled. It demonstrates implementation in various scenarios such as low light and darkness, and the system appears to provide efficient results in these conditions. In the future, we intend to improve the programme, which is currently unimportant. Furthermore, we attempt to broaden the research by analysing road conditions with the help of a rear camera. With some additional improvements, the system is now available to the general public.

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