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Real Time Drowsiness Detection System Using CNN

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Abstract: ***Driver fatigue and rash driving are the leading causes of road accidents, which result in the loss of valued life and decrease road traffic safety. Driver drowsiness solutions that are reliable and precise are essential to prevent accidents and increase road traffic safety. Various driver drowsiness detection systems have been developed using various technologies that are geared at the specific parameter of detecting the driver's tiredness. This research offers a unique multi-level distribution model for detecting driver drowsiness utilising Convolution Neural Networks (CNN) and. To detect the driver's behaviour and emotion, the driver's face pattern is handled with a 2D Convolution Neural Network (CNN). The suggested model is built with OpenCV, and the experimental findings show that it recognises the driver's emotion and tiredness more efficiently than existing technologies.***

Keywords: ***Drowsiness detection, Eye blinking, Voila Jones Algorithm, Support Vector Machine, Convolution Neural Network, Hidden Markov Models, OpenCV***

I. INTRODUCTION

There is an upsurge in the frequency of business accidents in India. Each time, buses and large vehicles such as motorcars, trucks, and exchanges are involved. Dozing and exhaustion are two of the most common causes of business mishaps. Driving in this scenario might be dangerous since it hampers the driver's judgement and attention. Drivers can prevent falling asleep at the wheel if they take precautions such as getting enough sleep before driving, drinking coffee, or taking a break when fatigued. However, when motorists are concerned that they are weary, they consistently decline to engage in one of these behaviours and continue to drive. Thus, recognising drowsiness is crucial as one method of reducing traffic accidents. This design stated that yawning and discovery are the most obvious indications of exhaustion and drowsiness.

The driver's attention position deteriorates as a result of insufficient sleep, extended uninterrupted driving, or any other medical condition such as brain disease, etc. Several studies on road accidents have found that weariness is a factor in around 30% of accidents. When a driver drives for an extended amount of time, it causes excessive weariness and frazzle, which causes the driver to get sleepy or lose information.

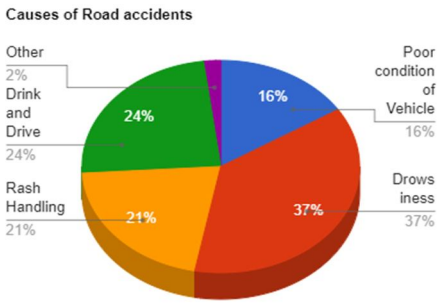


Fig 1. Causes of Road Accidents

Drowsiness is a complicated miracle that indicates a decrease in the driver's cautions and conscious circumstances. Though there is no direct technique to detect tiredness, numerous additional indirect ways can be applied.

The use of technology in any and every aspect of road safety is essential. We will have to take a systematic approach and encourage innovation in automotive components, vehicle safety and road engineering, including leveraging vehicle data management, connectivity, driving apps and dark spot identifications, as these will play a major role in improving road safety on roads. Following are some technology solutions that could help to make roads safer

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1) Driver fatigue detection and warning
2) Intelligent speed adaption
3) Speed governors
4) LIDAR gun

In this paper, we have studied different methodologies for implementation of drowsiness detection. We made use of machine learning techniques for drowsiness detection (eyes, yawning) and alerts the vehicle driver's drowsy situation. There are different factors associated with the drowsiness of the vehicle driver, this system uses the movement of eyes and mouth to predict the drowsiness.

II. LITERATURE SURVEY

Early Identification and Detection of Driver Drowsiness by Hybrid Machine Learning

In the proposed work, an emotion detection method based on Support Vector Machines (SVM) has been implemented using facial expressions[1]. Driver Fatigue Detection Based on Convolutional Neural Network using EM-CNN

A convolutional neural network, named EM-CNN, is proposed to detect the states of the eyes and mouth from the ROI images. The proposed algorithm EM-CNN outperforms other CNN-based methods, i.e., AlexNet, VGG-16, GoogLeNet, and ResNet50, showing accuracy and sensitivity rates of 93.623% and 93.643%, respectively.[2]

Driver Drowsiness Detection by Applying Deep Learning Techniques to Sequences of Images.

The first alternative uses a recurrent and convolutional neural network, while the second one uses deep learning techniques to extract numeric features from images, which are introduced into a fuzzy logic-based system afterwards. [3]

Deep Learning for Eye Blink Detection Implemented at the Edge

This innovative solution is compared with a more traditional method, based on a detection threshold mechanism. The performance, battery lifetime and memory footprint of both solutions are assessed for embedded implementation in connected glasses. The results demonstrate that CNN outperforms the accuracy obtained by the threshold based algorithm by more than 7%. [4]

Estimation of Driver Vigilance Status using Real-Time Facial Expression and Deep Learning

A new driver's vigilance detection system based on deep learning is proposed based on facial region diagnosis using the Haar-cascade method and convolutional neural network for drowsiness detection. [5]

Driver Drowsiness Detection Model using Convolutional Neural Network Techniques for Android Application

The proposed CNN based model can be used to build a real-time driver drowsiness detection system for embedded systems and Android devices with high accuracy and ease of use. [6]

The following factors enhance the risk of sleepy driving:

1) Have slept for fewer than 7 to 8 hours.
2) Use drowsiness-inducing medicine.
3) Drive late at night or early in the daytime.
4) Have trouble falling or staying asleep at night on a regular basis.
5) Drive for lengthy periods of time on monotonous highways or rural roads.
6) Work the night shift, especially if you're driving home afterward. [7]

In the physiological based measures:

The correlation between physiological signals ECG (Electrocardiogram) and EOG (Electrooculogram). Drowsiness is detected through pulse rate, heart beat and brain information. The study has given emerging technologies and various other approaches in order to prevent the fatalities caused by drowsiness and the accidents. [8]

III. PROPOSED-SYSTEM ARCHITECTURE

The system features have three main parts.

1) First: The system uses camera to collect the necessary data to locate drivers face region and eyes
2) Second: The system analyses the captured data.
3) Third: Based on the input it gives the output.

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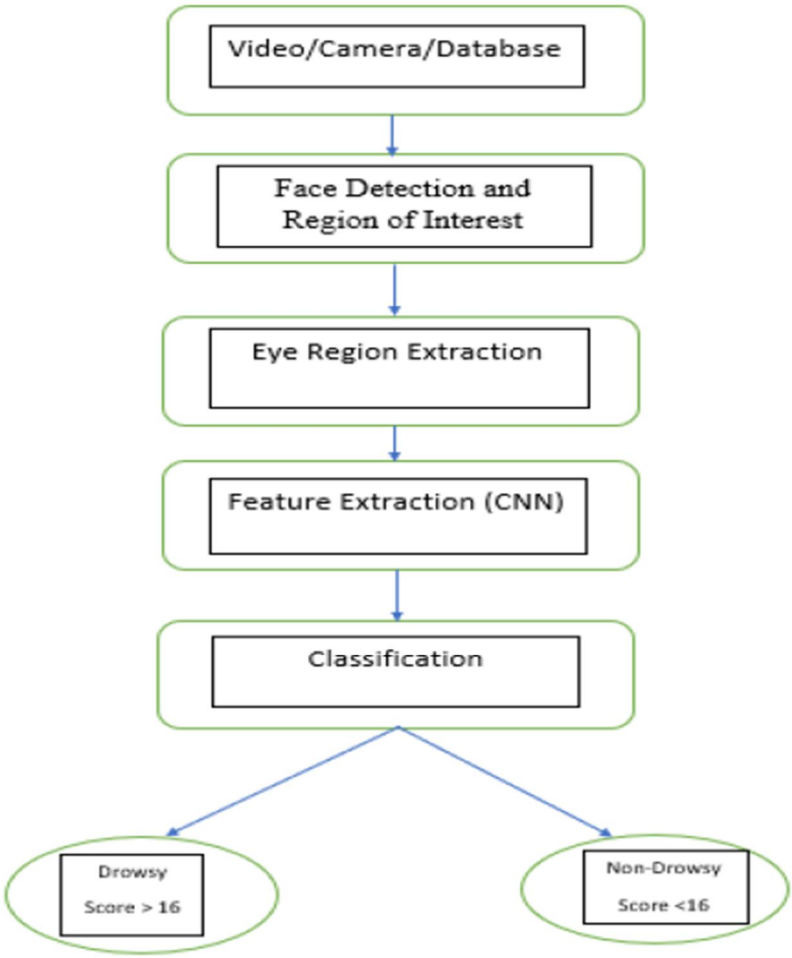


Fig 2. Proposed System Architecture

Only the eyes region is necessary to identify tiredness; the entire facial region may not be necessary. Face is initially identified from the photos using the Viola-Jones face detection technique. The Viola-Jones eye detection algorithm is used to extract the eye region from the facial images after the face has been identified. The Viola-Jones object detection algorithm, which was created in 2001 by P. Viola and M. Jones, is the first algorithm used to identify faces. The Viola-Jones algorithm uses three methods to detect faces: Haar-like features, Ada boost, and Cascade classifier. The Viola-Jones object detection technique using the Haar cascade classifier was employed in this paper and was developed using Python's OPEN CV. For identifying faces in photos, the Haar cascade classifier makes use of Haar characteristics.

To detect it, we begin by gathering real-time data from the camera while driving over a long distance. The driver's face movement is captured by the camera.

We are identifying ROI after face detection (region of interest). A region of interest (ROI) is a section of a picture that you wish to filter or manipulate.

We have ROIs that detect eye blinking. The frequency of eye blinking is computed, based on which sleepiness is diagnosed, and the movement of the lips is watched for yawing and alertness. As a result, the driver's tiredness is identified, and he or she is alerted to take a break.

For collecting real-time facial movement, we employed machine learning techniques such as Python interpreter and OpenCV. [10]

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IV. ALGORITHM

System starts to run when user open the software while driving for long hours. Steps for the same for as follows: -

1) Take Image as Input from a Camera
2) Create a region of interest and identify faces in the image (ROI)
3) Identify the eyes using ROI and provide the information to the classifier.
4) Whether the eyes are open or closed will be classified by the classifier.
5) Calculate a score to determine if a person is drowsy.

V. CONCLUSION

In this paper we have studied various implementations done in order to achieve the drowsiness detection. An innovative technique for detecting driver tiredness based on eye condition is put forth in this suggested work. This assesses if the eye is in an alert or drowsy condition, with an alarm sounding when the eye is in an alert state. The Viola-Jones detection technique is used to identify the face and ocular regions. To extract features, stacked deep convolution neural networks are created and employed throughout the learning phase. The CNN classifier uses a SoftMax layer to categorise the driver as either asleep or awake.

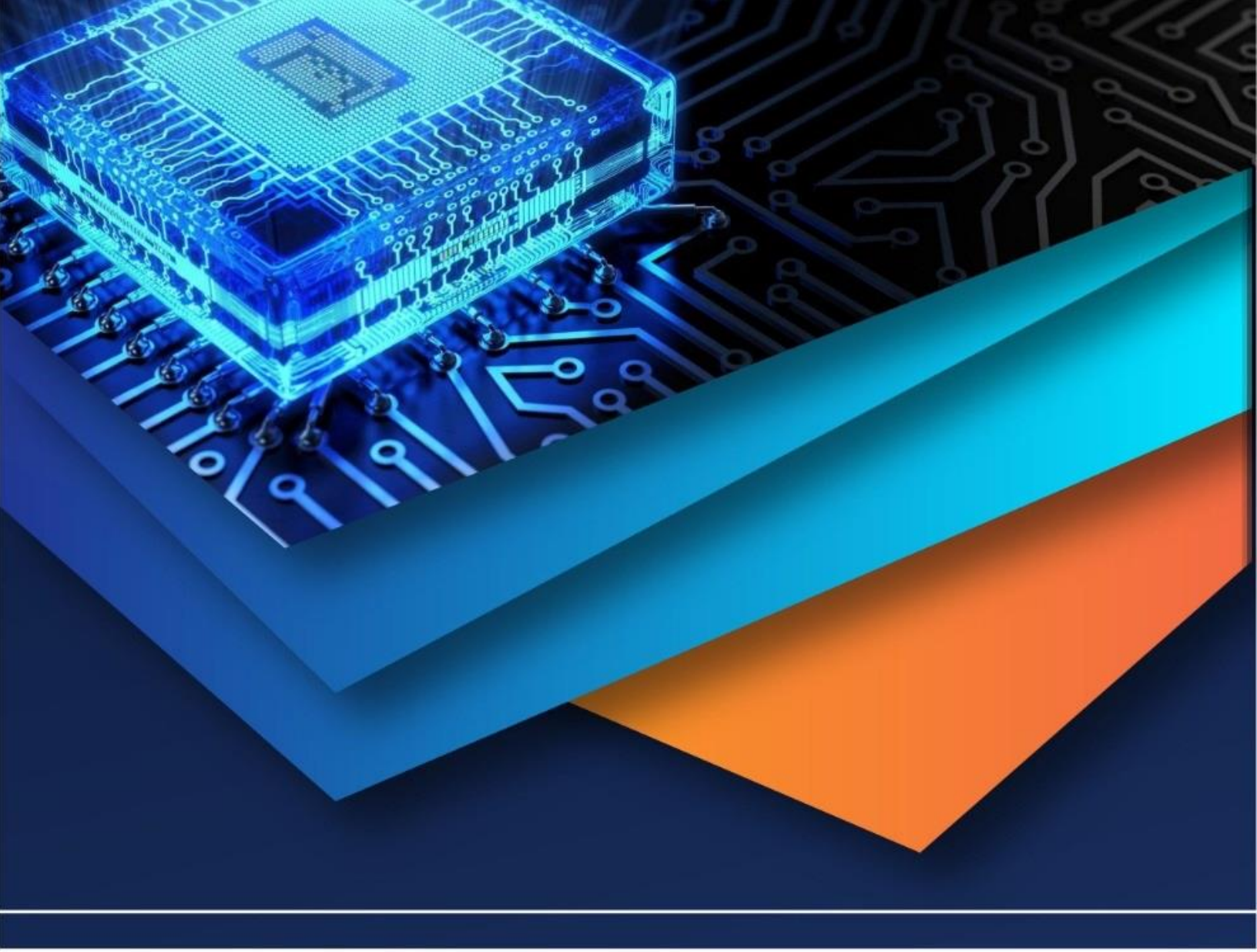
The major goal is to produce a system that is lightweight enough to be installed in embedded systems while still achieving good performance. To identify drowsy driving behaviour, the system was able to recognise facial landmarks in photographs taken using a device and feed the information to a trained Deep Learning model based on CNN.

To support cutting-edge driving assistance technologies or even a mobile device to provide intervention when drivers are tired, this system can be simply implemented into dashboards in the upcoming generation of automobiles. When the model consistently predicts that the output state will be drowsy, the proposed system efficiently detects the driver's alertness and sounds a warning. In the future, transfer learning will be used to raise system performance. Even in poor illumination, there is still space for performance improvement and better facial feature detection given the current state of the technology.

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