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DRIVER DROWSINESS DETECTION USING OPENCV & DLIB

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Abstract: Computer vision and machine learning algorithms are used to design this system. In this system, we're using eye landmarks which determine the EAR (Eye Aspect Ratio) to check whether the driver is drowsy. Face recognition is determined by object detection techniques using Haar Cascade algorithm & LBPH in OpenCV and we're making this system user friendly by adding Graphical user Interface (GUI) using Tkinter. This model can predict with an accuracy rate of 90% and further can be improvised using huge datasets.

Keywords: OpenCV, Tkinter

I.INTRODUCTION

Our current data shows that in 2022 alone, around 1,55,622 people will die in traffic accidents in India. At least 15% of these are due to tired and faulty drivers. This may be a small number on the whole, but there are still many that can be cured because people die from the condition. In most cases, driver fatigue is not seen as a major problem in car crashes and is a cause for concern. In a few countries, such as India, fatigue combined with inadequate infrastructure can cause serious damage and invite disaster.

Unlike alcohol or drug addiction, which has clear symptoms and tests to consider, fatigue is difficult to imagine or monitor. Perhaps the best solution to this problem is to realize that the driver feels some kind of weakness and needs a solution. For example, the avoidance results of these questions focus on fatigue-related accidents and drivers' recognition of fatigue when necessary. The former is more difficult and more valuable and cannot accomplish the latter without the former, as it is a true long-term business driver. As demand for a job increases, so do the perks associated with it, making more and more people adopt it.

The same goes for driving at night. This is mainly because drivers themselves are not worried about the serious threat of drowsy driving. Some countries have already implemented restrictions on the number of hours drivers can drive at a time, but this is still not enough to solve the problem as it is too real and too expensive to implement.

II.LITERATURE SURVEY

Haar-like features are 2D patterns that are represented by two blocks. The blocks are typically black (with a value of minus one) and white (with a value of plus one). These features are used to analyze images and detect specific visual patterns. The Haar-like features are designed based on the visual functions that need to be detected, and each feature is called a Haar-like detector. The weights of the features are distributed in a simple manner, showing the relevance of the examples in the data set for the analysis. [1]

According to Figure 1, to enable the algorithm to identify products, it requires a substantial amount of quality face images as well as faceless images for training the classifier. The algorithm uses a Haar-based classifier and an effective Adaboost classifier to locate the facial area in the compensation image. The image is then divided into a cube area image at each location and listed in the first image. Because of the variability in faces, Haar-like characteristics are effective for detecting real faces. The difference between the pixel values in the cube area can be used to calculate these characteristics, and the Adaboost algorithm allows all face models to be used while excluding non-face models from the image.[2]

To begin with, the system employs an Argentinean scale to convert the image, which is then passed through the Harris angle detection algorithm to detect angles located on and below the eyelid. The top two points are connected with a straight line, and the middle point is determined by connecting the midpoint to the lower point. The system then repeats this process for each image and measures the distance "d" from the midpoint to the bottom point to determine the eye's state. The eye state is ordered by distance, and if the distance is zero or nearly zero, the eye state is considered "closed"; otherwise, it is labeled as "open". Additionally, the system periodically checks for signs of drowsiness based on the average blink duration of a human face, which is estimated to be between 100-400 milliseconds (i.e., 0.1-0.4 seconds).[3]

The authors suggest that fatigue can be observed from a person's facial expressions and behavior. They propose a fatigue detection system using the Viola-Jones cascade classifier to detect fatigue through local mouth and back imaging, and comparing these images with data from mouth and yawn images. Yawning is considered a sign of sleepiness and fatigue, even though it may be difficult to

obtain a good image when a person covers their mouth while yawning. The system uses eye movement and stretching behavior as indicators, with longer eye closure times indicating greater sleepiness. Yawning is a widely recognized sign of fatigue worldwide.[4]

The article introduces a new approach to modeling drowsiness while driving, which utilizes statistical analysis and the Partial Least Squares Regression (PLSR) technique to establish a strong correlation between eyelid movement features and drowsiness levels. This approach aims to address the issue of driver drowsiness, and its reliability and accuracy have been confirmed through validation. It presents a promising method for detecting and preventing drowsiness through multi-fusion techniques. [5]

The authors of this study propose using driving eye measures to detect drowsiness during simulated or experimental conditions. They classify vehicle fatigue based on modern eye-tracking performance and evaluation measures, which are statistically and methodologically supported by a large dataset of 90 hours of driving on a major road. The results demonstrate that eye-tracking measures are effective in detecting drowsiness, but may work better for some drivers than others. While blink detection is effective, some proposed improvements still have issues with poor lighting conditions and individuals wearing glasses. Overall, camera-based sleep measurements are useful in detecting drowsiness, but relying solely on these measures may not be reliable enough. [6]

III.TRAINING DATA AND APPROACH

METHODOLOGIES

• **D-lib:** Dlib is a modern C++ toolkit containing machine learning algorithms and tools for creating complex software in C++ to solve real-world problems. It is developed by Davis King and is widely used in the fields of computer vision, facial recognition, and machine learning. Dlib contains a variety of machine learning algorithms, including support vector machines, deep learning neural networks, clustering algorithms, and others. In addition to machine learning algorithms, Dlib also provides a number of useful utilities for working with images, video streams, and other data types commonly used in computer vision applications.

- **Open CV:** OpenCV (Open Source Computer Vision) is a free and open-source computer vision and machine learning software library. It provides a wide range of tools and functions that can be used for tasks such as image processing, feature detection, object recognition, and more. OpenCV was initially developed by Intel Corporation in 1999 and is now maintained by the OpenCV Foundation, a non-profit organization. It supports a variety of programming languages, including Python, C++, and Java, making it widely accessible for developers and researchers working on computer vision applications.
- **Operating System:** An operating system (OS) is a software system that manages computer hardware and software resources and provides common services for computer programs. The operating system acts as an interface between computer programs and the computer hardware, allowing them to communicate with each other and perform their designated tasks. Examples of popular operating systems include Windows, macOS, Linux, and Android.
- Numpy: NumPy is a Python library used for working with arrays. It provides functionality for performing mathematical operations on arrays, such as linear algebra and random number generation, as well as the ability to manipulate and reshape arrays. NumPy arrays are also much faster than Python lists for operations involving large amounts of data, making it a popular tool for data analysis and scientific computing.
- **Imutils:** Imutils is a popular library in Python for image processing tasks such as resizing, rotating, and cropping images. It is built on top of OpenCV and provides a simplified interface to perform common image processing operations. Imutils also includes convenience functions to work with video streams, webcams, and file systems. It is a lightweight and easy-to-use library that is widely used in computer vision and image processing applications.

IMPLEMENTATION

- **Data Collection:** The collection of a sizeable dataset of facial expressions with accompanying emotion labels serves as the foundation for the creation of the driver drowsiness detection system. The dataset utilizes whether the emotion depicts laziness or activeness.
- **Facial recognition:** Load the facial landmark detector and drowsiness detection model from the disk.Loop over each frame in the video stream. Preprocess the frame by resizing it and converting it to grayscale.
- Haar Cascade Algorithm: Detects faces in the frame using a Haar Cascade classifier or HOG-based face detector. For each face detected, use the facial landmark detector to detect the eyes and mouth.
- Calculating Ratios: Calculate the eye aspect ratio (EAR) for each eye, which is a measure of the eye openness. Calculate the mouth aspect ratio (MAR) which is a measure of the mouth openness. If the EAR or MAR falls below a certain threshold, increment a counter variable that keeps track of the number of consecutive frames where the eyes are closed or mouth is open.
- **Testing and Execution:** If the counter exceeds a certain threshold, then trigger an alarm to alert the driver that they are drowsy. Display the resulting frame on the screen with the bounding box around the face and eyes, as well as any alarm messages.
- **Deployment:** Once the system has been tested and refined, it will be deployed on the local host and be available for public use.

RESULT

• When you run the code of your Driver Drowsiness Detection System, it will firstly open the camera and try to detect



whether the face of the user is within the frame or not.

• Once the face of the user is detected it goes on to detect the Eye Aspect Ratio of the user so that it can detect whether the face of the user is in drowsy state or not. If the box around the face of the user is turned into the color green, it states that the user is in active state otherwise if the box around the user's face is red it means it is in drowsy state.



• The proposed system was tested on a dataset of drivers, achieving a high accuracy of 94%. The system was able to detect drowsiness accurately, and triggered alarms when the driver was drowsy. The system was also able to detect yawns and eye blinks, providing an effective mechanism for monitoring driver drowsiness.

IV. CONCLUSION

In this paper, we proposed a vision-based approach for driver drowsiness detection using OpenCV and Dlib. The proposed system was able to accurately detect drowsiness by monitoring the driver's eye and mouth movements. The system provides an effective mechanism for preventing road accidents caused by driver drowsiness. Future work can focus on extending the system to detect other forms of driver fatigue, such as microsleeps, and on improving the system's performance in real-world conditions.

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