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Driver Drowsiness Detection System

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Abstract: This Paper is an evaluation report at the studies conducted and the challenge made inside the discipline of pc engineering to develop a system for motive force drowsiness detection to save you accidents from happening due to driver fatigue and sleepiness. The document proposed the results and solutions at the confined implementation of the various strategies which might be delivered in the undertaking. Whereas the implementation of the mission gives the actual-global concept of the way the gadget works and what changes can be finished to be able to enhance the application of the overall system.

Furthermore, the paper states the overview of the observations made by means of the authors to help similarly optimization within the cited discipline to reap the application at a higher efficiency for a safer avenue.

Index Terms **- motive force drowsiness; eye detection; yawn detection; blink sample; fatigue**

I. INTRODUCTION

People have generally constructed machines and cooked strategies to ease and defend their lives, for mundane sports like visiting oils, or for further thrilling purposes like aircraft trips. With the advancement in period, modes of transportation saved on advancing and our reliance on it started growing exponentially. Now, we will travel to places at a pace that indeed our grandparents wouldn't have notion doable. Now a days, nearly all sundry in this world makes use of many feathers of transportation every day. Many humans are rich enough to have their own veritably motors while others use public.

Still, there are many programs and canons of conduct for people who power anyhow of their social fashion ability. Neglecting our liabilities towards a further secure trip has enabled hundreds of hundreds of tragedies to get related to this extraordinary invention every time. One type of neglectfulness is not always admitting when we are too tired to press. To cover and save you a destructive result from similar negligence, numerous experimenters have written exploration papers on driving force doziness discovery systems. But at cases, some of the factors and compliances made by using the machine aren't accurate.

According to the report, there were a total of 412,432 tragic road accidents recorded in 2021, resulting in the loss of 153,972 lives and causing injuries to 384,448 individuals.[1] Among these incidents, a minimum of 21 percent can be attributed to driver fatigue, leading to errors or mistakes on the road However, it is important to note that this percentage may appear small in comparison to other causes of accidents. Fatigue as a contributing factor to accidents is often significantly underestimated despite its potential impact. The combination of fatigue and inadequate infrastructure in developing nations such as India can lead to disastrous consequences. Unlike alcohol and drug impairment, which can be easily detected through clear indicators and tests, fatigue is a challenging factor to measure or observe. Increasing awareness about the risks of fatigue-related accidents and encouraging drivers to acknowledge their fatigue when necessary are likely the most effective solutions to address this problem.

The aim of this research is to identify signs of driver fatigue. The detection system consists of three main components: the acquisition system, processing system, and warning system.[2] The acquisition system captures video footage of the driver's front face, which is then transferred to the processing block. The detection process occurs in real-time, and if driver drowsiness is detected, the warning system issues a warning or alarm.

II. LITERATURE SURVEY

There are three types of general styles to descry motorist doziness; they are, vehicle- grounded, gesture - grounded and physiological- grounded styles. The steering wheel movement, the accelerator of vehicle or pattern of vehicle thickets, vehicle's speed, and divagation in position of lane are covered continuously in the system which is grounded on vehicle[3]. Still, it's considered as motorist drowsiness if there's any divagation in the values detected. The detectors aren't connected to the motorist and this dimension is nonintrusive.

Visual gestures like blinking of eye, ending of eye, yawning, bending of headset. are examined for doziness discovery in behavioral based system. A simple camera is used to take images to be transferred as input to SVM algorithm to identify the below features and are called nonintrusive dimension.[4] Monitoring the physiological signals like EOG, ECG, the twinkle, EEG, palpitation rate etc. helps in detecting motorist doziness grounded on physiological system and their protrusive dimension due to the direct connection of detectors to the motorist. The current discovery of doziness styles is substantially grounded in machine learning algorithms.

To gain insight into the needs and requirements of the general population, we conducted a survey by exploring various websites and applications and gathering essential information. Utilizing this data, we conducted an analysis that provided us with fresh ideas and enabled us to develop different solutions for our project. Through our findings, we concluded that there is a demand for such an application and identified promising opportunities for success in this field.

A. VISUAL STUDIO CODE

Visual Code Studio is an IDE that includes many features such as it is lightweight as well as powerful for hardcode operations.

B. PYTHON LIBRARIES

a) **OpenCV:** has a function to read video, that is cv2. Video capture(). We can get admission to our webcam the use of bypass zero in the feature parameter.
b) **Pandas:** Pandas is a Python library that is utilized for dataset management. Pandas provides the necessary tools and functions to handle datasets, making it easier to preprocess, analyze, and prepare data for machine learning tasks.
c) **Date:** This library provides us with date and time
d) **Mediapipe:** Mediapipe is an open and flexible environment for building versatile machine learning pipelines that allow developers to create complex workflows for audio, video, and other sensor data.
e) **Utils:** Contains Inbuilt functions and classes for multiple operation.
f) **NumPy:** This allows the user to perform mathematical operation.
g) **Play sound** is a python library for playing audio visuals.
h) **Pyttsx3:** Pyttsx3 is a Python library used to convert written text into speech.

III. PRESENT SYSTEM

1.K. Dwivedi developed a system which identifies drowsiness of the driver using representational learning. A Haar-like face detector feeds the images to a 2-layer convolutional neural network for extracted features which are then used to train a SoftMax layer classifier for detecting whether a driver is drowsy or not drowsy. This system was able to yield a satisfactory result of 78% accuracy in detecting the drowsiness and alerting the driver.**[5]**

2.B. Warwick proposed a system that is based on physiological approach in which the driver utilizes a wireless biosensor named Bio Harness, which is a wearable device capable of gathering physiological data and transmitting it to a smartphone. **[6]**This data is then analyzed through Fast Fourier Transform (FFT) and Power Spectral Density (PSD) which provide the desired vectored inputs that can be fed into a Neural Network. This system is run on a drowsiness detection mobile app by the researchers.

3.Manu B.N: suggested that utilizes OpenCV feature-based cascade classifiers to detect faces. In the beginning, the algorithm requires a substantial number of positive images (images containing faces) as well as negative images (images without faces) to train the classifier responsible for detecting the object. So along using the fea with the OpenCV feature-based classifiers, cascaded classifier is exploited to recognize the face region then the compensated image is segmented into numbers of rectangle It is possible to detect objects in the original image at various positions and scales across different areas.**[7]**These can be calculated according to the difference of sum of pixel values within rectangle area and during the process the Adaboost algorithm will allow all the face samples and Furthermore, it will exclude non-face samples from the images.

IV. PROPOSED SYSTEM

Face and eye detection using OpenCV and the Mediapipe library. The proposed algorithms in OpenCV effectively detect and normalize human faces, which is crucial in reducing accidents related to vehicle crashes. The new approach significantly reduces the processing time compared to previous methods. Normalization is performed using the eyes as reference points.

In this method, the driver's images are captured by a webcam installed on the car dashboard. These images undergo preprocessing to prepare them for further processing by the system. The Mediapipe library is then used to search and detect faces in each frame. If a face is not detected, another frame is acquired. When a face is detected, a region of interest is marked within the face, specifically focusing on the eyes. Defining this region of interest reduces the computational requirements of the system. The eyes are then detected within the region of interest. If both eyes are detected and open, the blink counter is set to "20". If the eyes are closed in a particular frame, the blink counter is decremented, and a blink is detected. If the eyes remain closed for more than four frames, it indicates that the driver is drowsy. In such cases, drowsiness is detected, and an alarm is activated. This process is repeated as long as the driver is driving the car.

Additionally, the Mediapipe Face Mesh feature estimates 468 3D face landmarks in real-time, even on mobile devices. It utilizes machine learning to infer the 3D facial surface, eliminating the need for a dedicated depth sensor and relying solely on a single camera input.

V. SYSTEM DESIGN

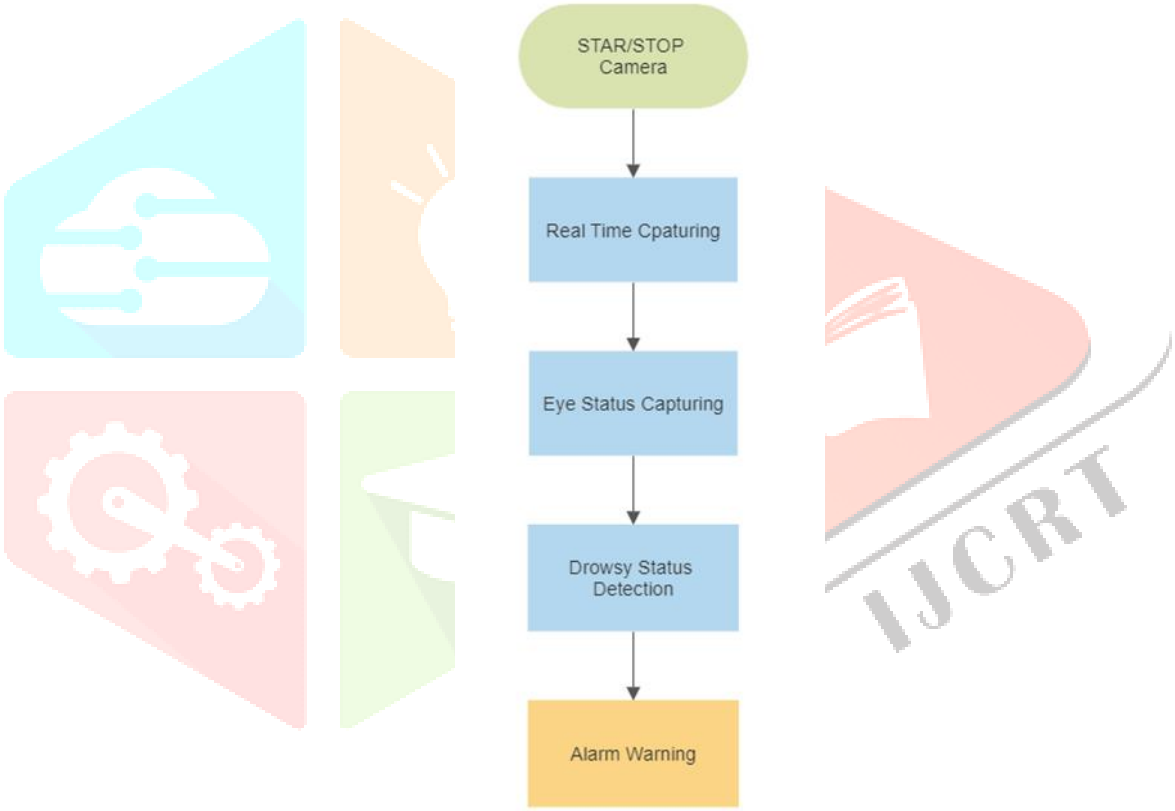

Fig.5.1. Data flow for System

The Eye Aspect Ratio (EAR) – EAR is determined by calculating the distance between vertical landmarks of the eye in the numerator and the distance between horizontal eye reference points in the denominator. The denominator is given more weight in the equation since there is only one horizontal reference point. When the eye is open, the aspect ratio remains relatively constant. However, it rapidly decreases and approaches zero during a blink.

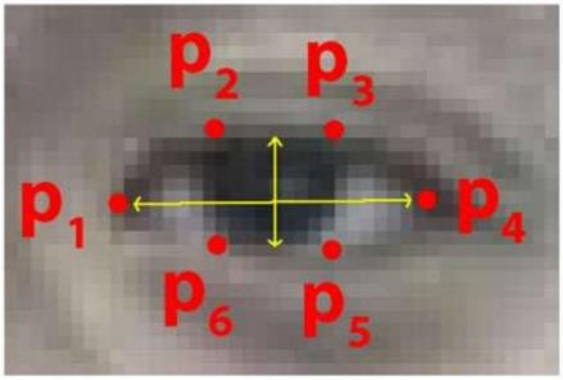

Fig.5.1. Eye Aspect Ratio Calculation

$$EAR = \frac{(p_2 - p_6) + (p_3 - p_5)}{2(p_4 - p_1)}$$

VI. Experimental Result

We've tested our program with input and go for the results. Below are a few screenshots showcasing the results obtained:

Fig.6.1. According to the user eyes it shows.
The driver is sleepy or not.

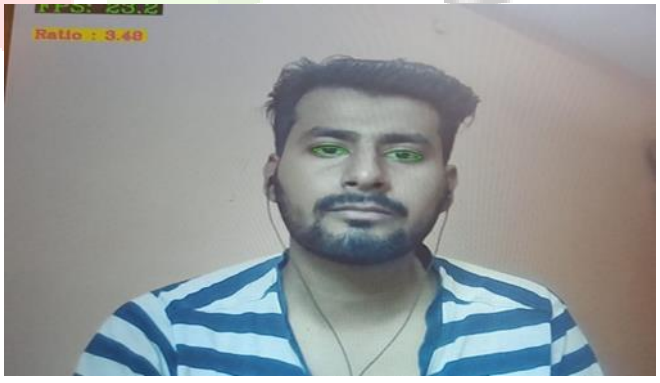

Fig.6.2.

VII. Conclusion

The proposed device in this study offers precise detection of driver fatigue. The study focuses on designing a drowsiness detection system for drivers, aiming to prevent road accidents caused by drowsy driving and help drivers stay alert by providing warnings when they become sleepy. The main concept of the drowsiness detection device is to detect and analyze behavioral, vehicular, and physiological parameters related to drowsiness. Interestingly, it is observed that drivers yawn less frequently rather than more in the moments before falling asleep, emphasizing the need for examples of actual sleep-related fatigue and drowsiness situations in the detection process.

Although physiological measures have a high accuracy rate in detecting drowsiness, they can be intrusive. However, this issue can be addressed by utilizing touchless electrode placement techniques. Therefore, it is worth considering the fusion of physiological measures, such as Dlib, with behavioral and vehicle-based measures to develop an efficient drowsiness detection system. Furthermore, it is crucial to consider the driving environment to achieve optimal results.

VIII. FUTURE WORK

The model's performance can be enhanced incrementally by incorporating additional parameters such as blink rate, yawning, car state, and more. By considering all these parameters, the accuracy of the model can be improved. Moreover, the project can be extended to include full-night light conditions by implementing an infrared (IR) webcam. **[8]** An IR webcam utilizes infrared radiation to determine whether a person is drowsy or not.

In our future project, we aim to integrate a sensor to track the driver's heart rate in order to prevent accidents caused by sudden heart attacks. The same model and techniques can also be applied to various other scenarios, such as streaming services like Netflix, which can detect when the user falls asleep and automatically pause the video. Additionally, it can be used in applications that prevent users from falling asleep.

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