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Driver's Drowsiness System

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Abstract: *Driver fatigue has become one of the leading causes of car accidents globally in recent years. Fatigue is often indicated by driver sleepiness, which can be quantified and monitored. Identifying driver sleepiness is crucial for the safety of individuals and property alike. The aim of this endeavor is to create a model of a sleepiness detection system that operates in real-time. The system captures images continuously while analyzing the eye's state using the mentioned approach and alerts the driver when necessary. Its primary goal is to issue warnings to drivers who may be drowsy, thereby enhancing road safety. Driver fatigue resulting in sleepiness is aprevalent cause of accidents on the road. Currently, it stands as a significant contributing factor to traffic accidents. Recent statistics indicate that a substantial number of accidents were caused by drivers who were too drowsy to operate their vehicles safely*

Keywords: Driver fatigue detection, Face Detection, Face Tracking, Eye Detection, Eye Tracking, Drowsiness detection, Distraction detection

I. INTRODUCTION

Driving while intoxicated is a leading cause of most traffic accidents. Being drowsy on the road can result in severe consequences such as fatalities, significant financial losses, and serious injuries. Drowsiness while driving can cause a person to feel lethargic, lose focus, and have tired eyes. India has a high rate of accidents due to distracted driving, with driver fatigue being a significant factor insuch incidents.

Operating a vehicle when feeling drowsy may cause a gradual reduction in the driver's abilities. In response to this concern, we created a system that can identify signs of driver fatigue and issue timely alerts to the driver, avoiding any potential accidents. This system employs a camera to record images as a video stream, locate the driver's eyes and face, and recognize them. The system then utilizes Perclos to analyzethe driver's eye activity and determine theirlevel of drowsiness.

II. BACK GROUND/ RELATED WORK

1.Driver's fatigue detection based on yawning extraction

A. Amine, M. Rziza, and Nawal Alioua (2016)

In this work, we propose a novel method for recognizing mouths using the Circular Hough Transform (CHT) applied to mouth regions extracted from images. Additionally, we introduce a non-intrusive and efficient system for detecting yawning by employing a support vector machine (SVM) trained on face extracted regions..

2. A Hybrid Approach to Detect Driver Drowsiness Utilizing Physiological Signals to Improve System Performance and Wearability

N. Badruddin, M. Drieberg, and M. Awais 2017

To enhance the identification of drowsiness in drivers, the suggested approach involves merging features obtained from both electrocardiography and electroencephalography. detection performance. It was shown that using EEG and ECG together, as opposed to using them separately, improved the system's performance in distinguishing between alert and drowsy states.

3. A comparison of intrusive and non- intrusive techniques for acquiring signals in driver drowsiness detection is presented.

Licinio Oliveira, Christer Ahlström, Jaime S. Cardoso, and A. Lourenço 2018

The aim of this study is to compare the efficacy of driver drowsiness detection using invasive methods such as electrooculogram (EOG) with non- intrusive, camera-based methods. We conducted a real-world experiment involving sleep-deprived drivers and collected data to evaluate the effectiveness of both approaches.

4. An IoT-based system for detecting drowsy driving in real-time, aimed at reducing the occurrence of road accidents, is presented.
Md. Yousuf Hossain, Fabian Parsia 2018
Incorporating a buzzer to alert the driver
when the eye closure ratio exceeds the standard is a component of a real-time, non- intrusive system designed to detect drowsiness in drivers.
Presently, driving while drowsy stands out as a leading cause of traffic collisions. Statistics show that drowsy driving causes a significant number of traffic accidents, many of which end in fatalities and serious injuries.

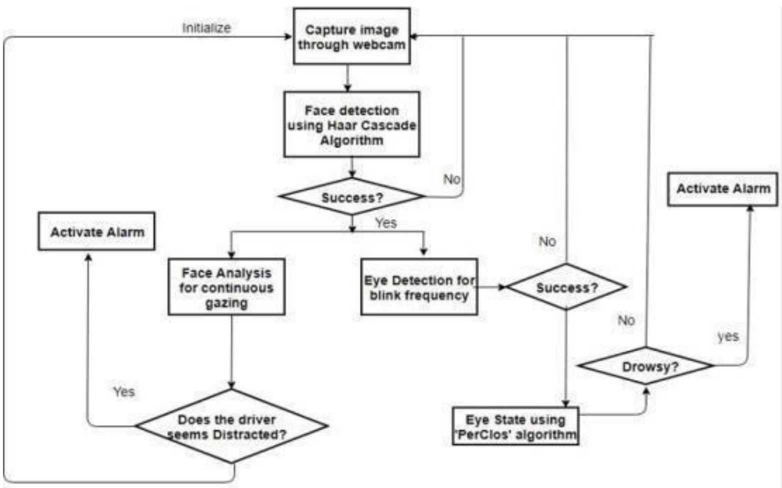
5. This paper proposes a Convolutional Two-Stream Network that utilizes multi- facial feature fusion to detect driver fatigue.
Zengwei Yao, Xintao Jiao, Jiahui Pan, Weihuang Liu, Jinhao Qian, and Driver fatigue can be detected using a two- stream network and multi-facial features that can mix static and dynamic picturedata, while partial facial images used as network inputs can concentrate on data relating to driver exhaustion, improving performance.

6. The creation of a realistic dataset and a baseline temporal model for detecting early signs of drowsiness is the focus of this study.
In their 2019 publication, Reza Ghoddoosian, Marnim Galib, and V. Athitsos discuss the significance of early drowsiness detection, which allows for timely alerts and provides individuals with sufficient time to respond. They also introduce a publicly accessible dataset that includes real-life footage of 60 participants, each categorized as alert, low vigilant, or drowsy.

7. This article delves into the detection and analysis of the driver's state using electrocardiogram (ECG).
Arun Sahayadhas, Jerritta Selvaraj, and Suganiya Murugan in 2020
Using physiological (ECG) data to monitor and analyse the driver's state, this work demonstrates that two-class detection offers more accuracy when detecting various states.
The main factors that cause traffic accidents, which result in abrupt death, injury, a high fatality rate, and monetary losses, are driver weariness, driver drowsiness, and inattentiveness.

III. PROPOSED SYSTEM

FLOW CHART:



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The objective of this system is to detect signs of driver sleepiness. Firstly, the webcam takes photographs, and the Haar Cascade algorithm is employed to identify faces within them. Haar characteristics play a crucial role in recognizing faces. Once the system confirms the presence of a face, it proceeds to the next stage, which is eye detection. Using Haar cascade characteristics, the system detects the eyesand records blink frequency. The Perclos algorithm is then utilized to determine the state of the eye by calculating the amount of time the eyelids remain shut. If the eyes arefound to be closed for prolonged periods, the system assumes the driver is drowsy and emits an alert.

MODULAR DIVISION:

- **Face Detection**: The module described in this paragraph utilizes video input from a camera to detect and identify faces. This isprimarily accomplished using the Haar cascade classifiers, specifically the Frontal face cascade classifier. Once a face is detected, it is recognized as a rectangular shape and subsequently transformed into a grayscale image.
- **Face Tracking:** As the project operates in real-time, it is essential to continually monitor faces for any indications of distraction **.**Consequently, faces areconstantly detected throughout the entire time.
- **Eye Detection**: In order to detect drowsiness, the focus of our model is on analyzing the eyes. To achieve this, we utilize the Haar Cascade Eye Classifier, a type of haar classifier, to identify the position of the eyes in the video input. The eyes are detected using rectangular shapes, which are then processed to analyze variousfactors such as eyelid movement and pupil size, allowing us to accurately detect signs of drowsiness.
- **Eye Tracking:** he module described in this paragraph receives input from the preceding module, and its primary functionis to analyze the eye movements to detect signs of drowsiness.
- **Drowsiness detection:** After determining the blink frequency in the previous module,if it remains at 0 for a prolonged duration, the system notifies the driver of potential drowsiness.
- **Distraction detection**: The face trackingmodule continuously scans the driver's facefor any repetitive motions or prolonged eyecontact without blinking, which might be interpreted as a lack of driver focus and trigger a distraction alarm from the system.

IV. TESTING

Software testing is a crucial process to ensure that a software system meets its requirements and user expectations. It involves identifying any flaws or weaknesses in the software and verifying that different parts, subassemblies, and the finished product are functioning as expected. There are various types of tests that can be conducted based on specific criteria. Testing helps to detect errors and bugs in the software, ensuring that it is reliable, functional, and delivers the desired results.

V. RESULT ANALYSIS

Fig. Output for face detection

The figure displays the result of the face detection module. This module receives a constant stream of video as input and generates face detection within a rectangle as output. The Haar cascade method is employed to recognise the face, which is identified using haar characteristics and isenclosed within a rectangular frame. The Frontal face cascade classifier of the Haar classifiers is mostly used to accomplish face detection.

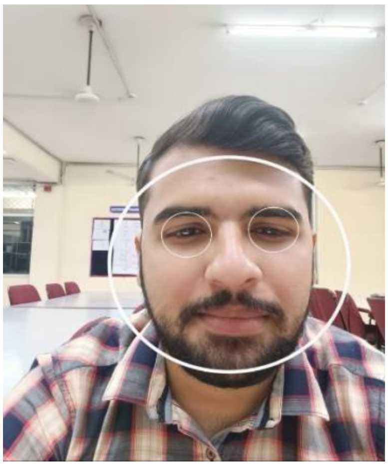

Fig**.** Output for Eye detection

The output fig is used to detect eyes. The technology recognises eyes in rectangular frames inside the specified specific frame. Haar cascade is the algorithm used to find the eyeballs. It makes use of haar characteristics, which can identify eyeballs in rectangular frames.

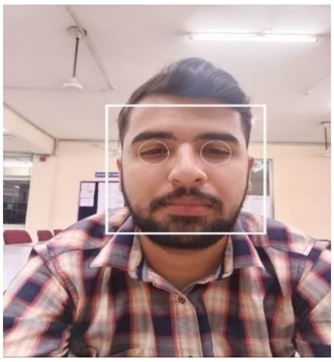

Fig. Drowsiness Detection

The sleepiness detection output is illustrated in fig. If the system detects signs of drowsiness, it will notify the driver. The alert message "You are sleepy" will be presented both verbally and acoustically. The goal of the sound is to wake up the driver. The perclos algorithm is used to detect drowsiness. The algorithm calculates the distance between two eyelids, and if it falls below a set threshold, an alarm is triggered. It usually takes between 3 to 5 seconds to determine if someone is drowsy.

Fig. Distraction detection

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The result of distraction detection is shownin fig. It will inform the motoristwhen he istaking his eyes off the road by sounding analarm. If the driver's eyes are not detected, the system detects distraction. It sends an alert in the form of a message and a sound if the motorist appears to be looking away from the road and towards something else.Face detection algorithms can be used for this, and if the face is not recognized for a predetermined period of time, a warning isgiven to the driver.

VI. CONCLUSION

A new automated technique to detect driver drowsiness was developed in this study. The system continuously analyses the video inputto identify signs of drowsiness. The Haar cascade method is used to detect faces and eyes based on predefined Haar characteristics. The image is processed with the perclos algorithm to determine the frequency of blinks. If the perclos value stays at 0 for an extended period, the system alertsthe driver with an alarm to wake them up. Constant values for longer periods indicate that the driver is distracted, and another alarm is triggered.

FUTURE SCOPE

To enhance the detection of driver drowsiness, this study proposes the removal of mouth regions where yawning occurs. Frequent and prolonged yawning is a clear indicator of driver fatigue. An alert can be sent to the driver when the number of yawnsgoes beyond a predetermined threshold. Additionally, an IR webcam can be used to provide full night vision, as it is capable of detecting infrared radiation to determine if the driver is feeling drowsy.

While currently a research project, there is potential for this technology to develop into a fully functional application that can be independently run by end users on their own systems for various purposes.