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DROWSINESS DETECTION AND ALERT SYSTEM

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ABSTRACT

Nowadays, incidents happen during drowsy road trips and are on the rise; it is well-known that many accidents result from driver fatigue and sometimes inattention. This research is primarily focused on enhancing efforts to identify drowsiness in drivers under real driving conditions. The purpose of driver drowsiness detection systems is to aim to reduce these traffic incidents. The secondary data collected emphasizes previous studies on systems for detecting drowsiness, and various methods have been employed to recognize drowsiness or inattentive driving. Our objective is to provide an interface that allows the program to automatically detect the driver's drowsiness and recognize it in the event of an accident by using an image captured by a webcam, examining how this information can enhance driving safety. This vehicle safety project aims to prevent accidents caused by driver sleepiness. Essentially, it involves collecting a human image from the webcam and exploring how that information can be utilized to improve driving safety. The system collects images from the live webcam feed and applies a machine learning algorithm to analyze the image and determine if the driver is drowsy. When the driver shows signs of sleepiness, an alarm sounds and the volume increases. If the driver does not awaken, a text message and email will be sent to their family members regarding their situation. Thus, this tool extends beyond merely detecting drowsiness while driving, incorporating eye extraction and face recognition using dlib.

Keywords: Eye extraction, Dlib, Facial Extraction, Drowsiness, Machine Learning, EAR, Python, Face Detection.

I. INTRODUCTION

Car accidents are the leading cause of fatalities, claiming around 1.3 million lives each year. Most of these incidents result from driver distraction or drowsiness. Drowsiness diminishes the driver's focus, engagement, vigilance, and attentiveness, causing the driver to make delayed decisions or sometimes fail to make any decisions at all. Drowsiness impairs mental alertness and decreases the driver's capacity to operate a vehicle safely, increasing the likelihood of human error, which can result in death and injury. The error rate for drivers has decreased. Countless individuals travel long distances on the road day and night. Insufficient sleep or distractions, such as phone conversations or chatting with passengers, can lead to accidents. To prevent these incidents, we propose a system that will alert the driver if they are distracted or drowsy.

Fig: Drowsy Driver

Face and brand recognition is utilized through image processing of facial images captured by the camera to identify distractions or drowsiness. To address this issue, we developed a solution in the form of image processing. Image manipulation is performed, using the OpenCV and Dlib open-source libraries. Python is chosen as the programming language to implement the concept.

An infrared camera is employed to continuously monitor the driver's facial features and eye movements. This project primarily concentrates on the driver's eye characteristics. The eye features of the driver are continuously monitored to detect drowsiness. Images are captured by the camera, and these images are sent to an image processing module that performs face recognition to identify distraction and drowsiness in the driver. The following use cases are included in this project.

II. METHODS AND MATERIAL

Tools & Image Processing Methods

OpenCV:

OpenCV (Open-Source Computer Vision) is the versatile tool for computer vision, featuring a wide array of modules that can assist with various computer vision challenges. However, perhaps the most beneficial aspect of OpenCV is its architecture and memory management.

It provides a framework for working with images and videos in any way desired, utilizing OpenCV algorithms or your own, without the hassle of allocating and reallocating memory for your images. The optimized capabilities of OpenCV make it suitable for real-time video and image processing.

The highly efficient image processing functions of OpenCV are employed by the author for real-time image handling of live video streams from the camera.

Dlib:

Dlib is a contemporary C toolkit that includes algorithms and tools for machine learning, facilitating the development of complex C++ software to address real-world challenges. It finds applications across a broad spectrum of fields in both industry and academia, such as robotics, embedded devices, mobile phones, and large-scale, high-performance computing environments. Dlib's open-source licenses allow free use in any application. The author utilizes the open-source Dlib library for implementing CNN (Convolutional Neural Networks). The author applies highly optimized prediction functions and detectors of previously learned facial shapes to identify facial features.

EAR (Eye Aspect Ratio):

The numerator of this equation measures the distance between the vertical landmarks of the eye, while the denominator represents the distance between the horizontal reference points of the eye, with the denominator weighted accordingly since there is only one.

The eye aspect ratio remains relatively constant when the eye is open, but it rapidly approaches zero when a blink occurs. When a person blinks, the aspect ratio of the eyes decreases significantly and nears zero. As illustrated in Figure 2, the eye aspect ratio remains constant, then swiftly drops to zero before rising again, indicating that a single blink has taken place.

Face Recognition:

The following sections outline the face recognition algorithms Eigenface, Fisherface, and Histogram of Local Binary Patterns (LBPH), along with their implementation in OpenCV. Local binary patterns were utilized as classifiers in computer vision as early as the 1990s by Li Wang [4]. The combination of LBP with histogram-oriented gradients was introduced in 2009, enhancing performance on certain datasets [5]. For feature coding, the image is divided into cells (4 x 4 pixels), using surrounding pixels in a clockwise or counterclockwise manner. The values are compared with the central ones, as depicted in Figure 6. The intensity or brightness value of each neighboring pixel is compared to that of the central pixel.

III. ALGORITHM STEPS

Step 1 – Capture an image from a camera.

Step 2 – Detect the face in the image and establish a region of interest (ROI).

Step 3 – Identify the eyes within the ROI and forward them to the classifier.

Step 4 – The classifier determines whether the eyes are open or closed.

Step 5 – Compute the score for verification when the individual is drowsy.

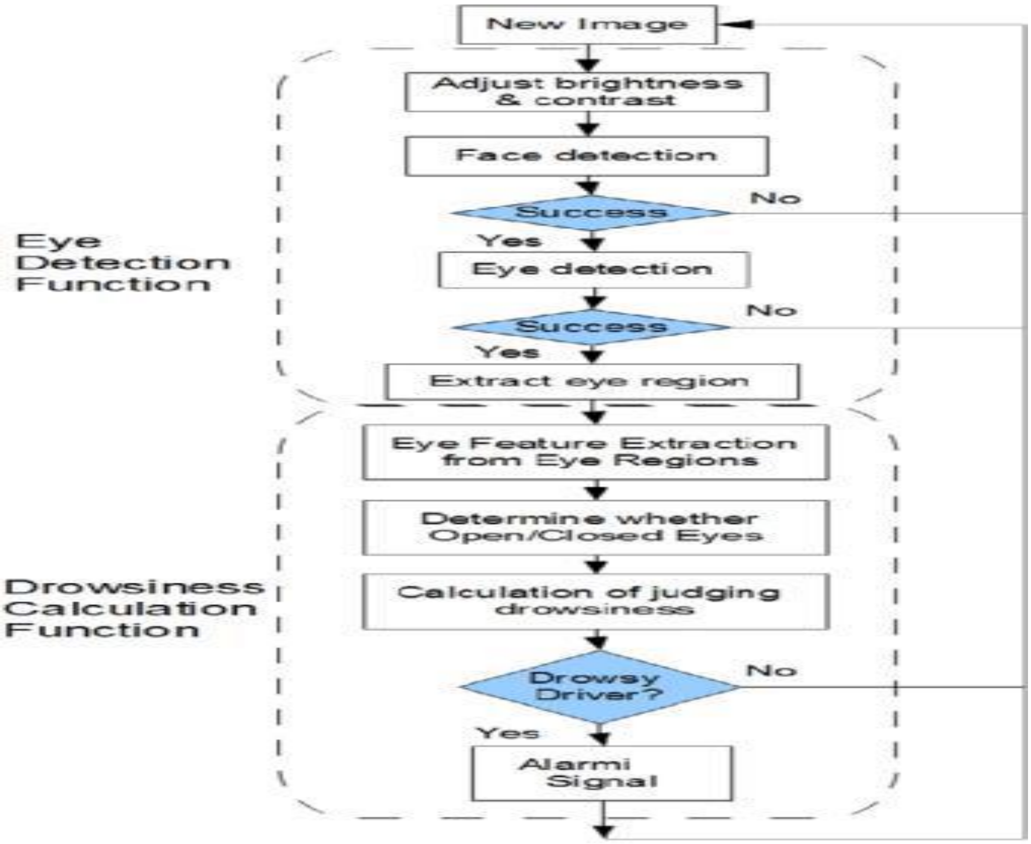

Fig: Drowsiness Detection

IV. RESULTS AND DISCUSSION

In this system, we have divided it into several components, as outlined below:

1. Login Module –

In this component, the user will be able to access the system and initiate the drowsiness detection system, which will activate the camera and begin monitoring the driver. In this module, the user must provide their credentials, such as username and password.

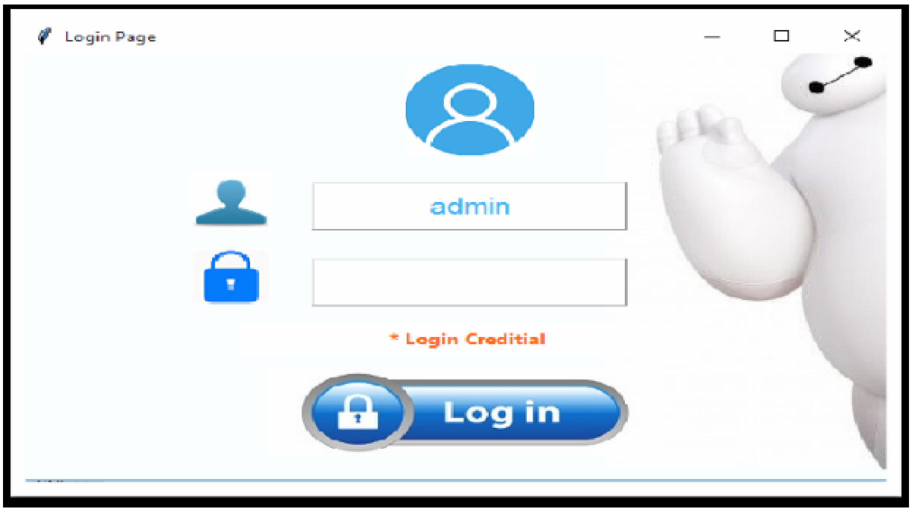

Fig: Login Page

2. Registration Module –

In this component, the user can register their information, including their contact number, email, and details of family members along with their phone numbers and email addresses. This information will be used to alert them by sending emails and SMS in the event of drowsiness.

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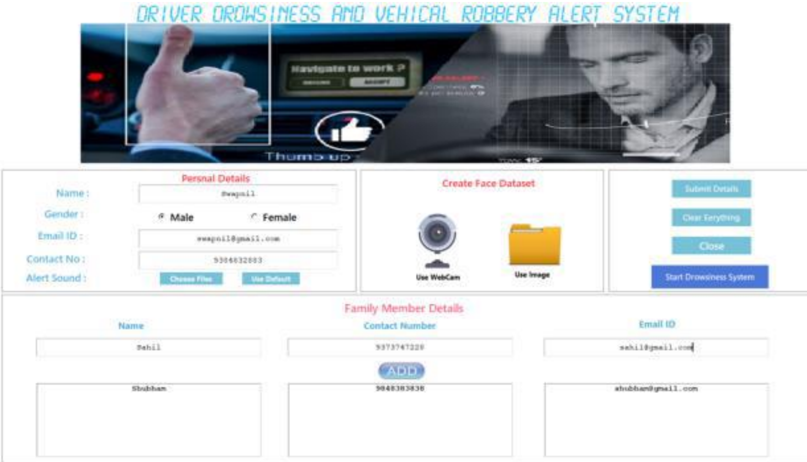

Fig: Registration Page

3. Eye Extraction Module –

In this component, it will identify the eyes and facial landmarks from the live webcam feed and apply algorithms to the image to determine whether the driver is drowsy or not.

Fig: Eye Extraction

4. Drowsiness Detection Module –

In this component, it will identify the eyes from the live webcam feed and utilize algorithms on the image to determine whether the driver is drowsy or not.

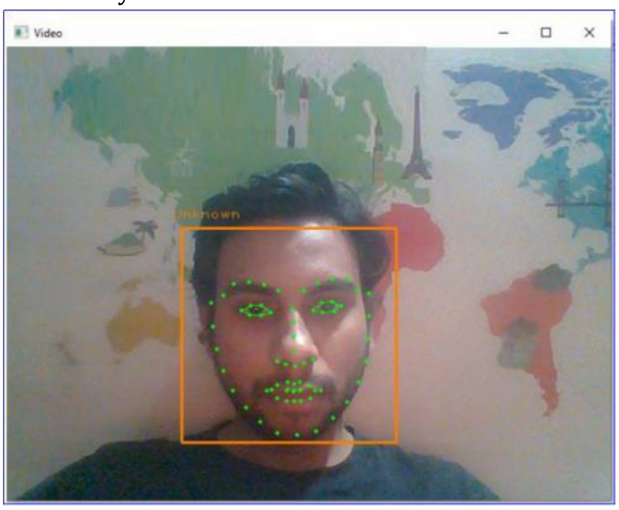

Fig: Face Identification

5. Alert Module –

If the driver does not awaken after 50 alarm alerts, it will send an SMS and email to the user's family members to notify them that the driver is drowsy, along with the driver's current photo and location.

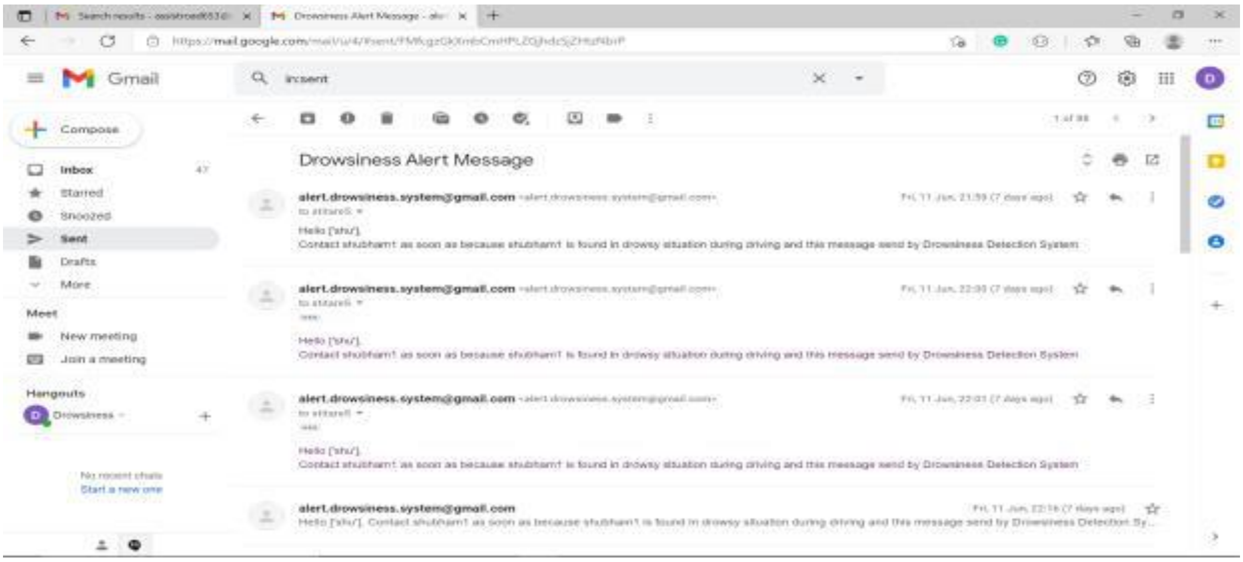

Fig: Alert Message

V. CONCLUSION

The proposed device in this evaluation provides accurate detection of driver fatigue. The assessment and design of the driver drowsiness detection system are presented. The suggested device aims to prevent various road accidents caused by drowsy driving and can also help drivers stay alert while driving by issuing a warning when the driver is sleepy. The fundamental concept of the drowsiness detection system is to monitor and provide data on behavioral, vehicular, and physiological parameters.

It appears that just before falling asleep, drivers yawn less frequently. This underscores the importance of understanding patterns of fatigue and drowsiness situations in which individuals actually doze off. Although the accuracy rate of using physiological measures to detect drowsiness is high, these methods tend to be quite intrusive. However, this intrusive nature can be mitigated through the use of contactless electrode placement. Consequently, it would be beneficial to integrate physiological measures, along with Dlib, with behavioral and vehicle-based metrics in the development of an effective drowsiness detection system. Furthermore, it is essential to consider the environment to achieve optimal results.

VI. REFERENCES

[1] A Study of Heart Rate and Brain System Complexity and Their Interaction in Sleep-Deprived Subjects. Kokonozi A.K., Michail E.M., Chouvarda I.C., Maglaveras N.M. Bologna, Italy. : Computers in Cardiology, 2008.

[2] Effects of partial and total sleep deprivation on driving performance. Peters R.D., Wagner E., Alicandri E., Fox J.E., Thomas M.L., Thorne D.R., Sing H.C., Balwinski S.M. 1999.

[3] Effect of driving duration and partial sleep deprivation on subsequent alertness and performance of car drivers. Otmani S, Pebayle T, Roge J, Muzet A. 2005.

[4] Template Matching. [Online] Apr 21, 2014 [Cited: Sep 8, 2014.] Real time drowsy driver detection using haarcascade samples. Dr.Suryaprasad J, Sandesh D, Saraswathi V.

[5] Integrated Approach for Nonintrusive Detection of Driver Drowsiness. Yu, Xun. Duluth : s.n., 2012.

[6] Rajneesh, "Real Time Drivers Drowsiness Detection and alert System by Measuring EAR," International Journal of Computer Applications (0975 – 8887) Volume 181 – No. 25, November- 2018 .

[7] Jay D. Fuletra., "A Survey on Driver's Drowsiness Detection Techniques" International Journal on Recent and Innovation Trends in Computing and Communication ISSN: 2321-8169 Volume: 1 Issue: 11 ,2013.