Auto Alerting and Identification System

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Abstract* - To improve safety in road areas, It is essential that vehicles are equipped with reliable safety features that help prevent accidents and minimize loss of life and property. Recent reports have shown a significant increase in accidents in nighttimes due to drivers rushing to reach their destination. As a result, Driver drowsiness detection systems are becoming increasingly popular as a means of reducing the number of accidents caused by driver fatigue. These systems use a combination of sensors and machine learning algorithms to monitor the physical and behavioral characteristics of drivers in real-time, allowing them to detect when a driver is becoming drowsy or fatigued. Sensors used in these systems may include cameras, biometric sensors, and steering sensors, which track various indicators of driver drowsiness, such as eye movements, facial expressions, heart rate, and skin conductance. When the system detects signs of drowsiness, it can alert the driver using audible warnings, visual cues, or vibrations, giving the driver time to take a break and rest before continuing their journey. The potential benefits of driver drowsiness detection systems are significant, as they can help reduce the number of accidents caused by fatigue, improving road safety for all road users.

Keywords – Driver drowsiness, prevention of accidents, alert system, System Camera, Buzzer.

I. INTRODUCTION

A recent survey has revealed that driver fatigue is responsible for almost 50% of annual traffic fatalities, making it a significant issue that technology could potentially address to prevent accidents. Various techniques have been proposed in the literature to detect driver fatigue, and many countries have begun prioritizing driver safety in the past decade. Researchers have explored methods such as physiological detection and road monitoring to identify fatigue in drivers. Physiological detection utilizes the close relationship between a user's sleep patterns and their pulse rate and brainwaves. However, this method requires electrode connections on the driver's head, face, or chest, which is impractical for everyday use. The automobile industry, along with traffic regulators and research and development teams, face the challenging task of reducing the occurrence and severity of accidents. One potential solution is to alert drivers to restricted areas before they begin driving using audio or visual signals, warning them of obstacles on the road ahead. This approach could help prevent accidents before they occur and promote safer driving practices.

II . LITERATURE REVIEW

A. Project Reviews

The study by Li and Chung eliminated noise from both low- and high-frequency ECG data using bandpass channels and thresholding. After pre-processing, in which the yield data is divided up into recurrence areas using faster Fourier transforms (FFT), it needs to be processed to remove the important elements for grouping. Li et al. conducted contrastive analyses on EEG data to assess a driver's drowsiness. They used Independent Component Analysis (ICA) to extract and focus combined EEG data on particular mental tasks. Highlights are segregated from the preprocessed data in the recurrence area. Similarly, picture subtraction, morphologically closed activities, and binarization were some of the progressive image-sifting techniques utilized by Dasgupta et al. Finally, I counted the pixels around the eyes to identify the eye conclusion. Ramzan et al. reduced the brief contrast of consecutive picture outlines by removing important highlights. They used them to look at the norms of eyelid development while sleepy. Meanwhile, the face estimation technique developed by Oyini Mbouna et al. has become a standard from which various face location methods can be created. Three classifiers are created (focused on the driver's head's even pivot) in an effort to more accurately recognize faces that are facing forward, to the left, and to the right.

III. DRAWBACKS OF EXISTING SYSTEM

Ensuring passenger safety is a top priority in today's automotive industry, and one of the major challenges faced by road users is accidents caused by reckless driving. The vehicle system presented here is a step towards addressing this issue. The demand for a safety solution is therefore high, and an automated and alarm system such as this can help improve road safety.

A. Target Specifications:

After defining the projects and assessing consumer demands for these solutions, specific interface requirements were established to ensure successful implementation. Each scenario outlines the system's operational mode and vehicle compatibility, with specific emphasis on key parameters. The system design and evaluation will prioritize dependability, low cost, reduced power consumption, quick response time, durability, ease of vehicle adaptation, compactness, and high security.

IV. PROPOSED SYSTEM

This study focuses on the development of a driver fatigue detection system for automotive vehicles. The study investigates the driver's attention levels in different scenarios, including low light and when the driver is wearing glasses. The proposed system utilizes retina monitoring to continuously monitor the driver's level of alertness. The system can identify drowsiness in less than fifteen seconds and alerts the driver through warnings and buzzers sound. The goal of this system is to reduce accidents caused by drowsy driving.

V. ARCHITECTURE

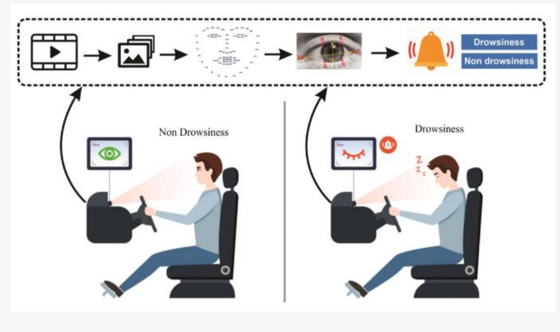

Fig 1: Working function of proposed system

1. Input Image: The system's input image is a video stream obtained from a camera installed on the car's front windscreen.

2. Pre-Processing: In the preprocessing stage, the color image is converted to grayscale and a series of filters are used to improve the image quality and eliminate noise.

3. Haar Cascade Classifier Algorithm: This algorithm is used to detect faces. It operates by looking for pixel-intensity patterns that closely resemble facial features. The technology then extracts the region of interest (ROI) around the eyes after identifying the face.

4. Feature Extraction: The system analyses aspects including eye closure, blink frequency, and eyelid movement to assess whether the person driving is sleepy.

5. Face Detection: It works by looking for a pixel-intensity pattern that closely resembles a face.

6. Iris Detection: It measures the pupil's diameter and monitors the eye's movement. This aids in figuring out if the driver is sleepy.

7. Alarm: If the system notices that the vehicle's driver is drowsy, a warning is set off.

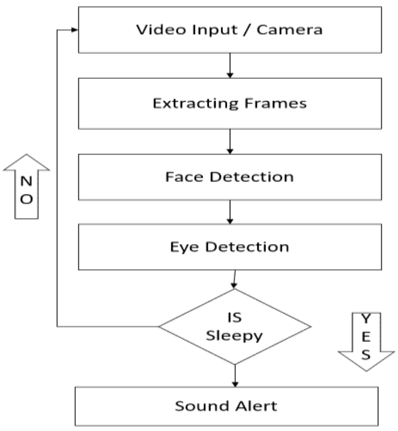

Fig 2. Flowchart of Proposed System

A. Haar Cascade Classifiers:

In image processing, the contrast and luminance of pixels can be modified to distinguish between bright and dark regions. Haar-like features are generated by combining contiguous groups of pixels with relative brightness differences. These features can be scaled to identify objects of different sizes. However, it is not practical to compute all possible features for sub-images, which consist of 24 x 24 pixels and have over 180,000 possible features. Instead, a subset of features is used to evaluate whether a sub-image may contain the target object. The goal is to eliminate up to 50% of sub-images that do not contain the object at each level of evaluation, using increasingly more features to examine the remaining sub-images. This approach is known as the cascaded classification algorithm.The object detection process involves utilizing various Haar-like features to detect objects of different sizes. However, it is not feasible to compute all 180,000 features that make up a 24 x 24 sub-image, even though computing a single feature is incredibly fast and efficient. Hence, only a subset of these characteristics is used to determine if a sub-image may contain the target object. This allows for the removal of a large proportion, roughly 50%, of sub-images that do not include the object. At each stage of the process, more features are used to assess the sub-image, and only the sub-images with the highest likelihood of containing the object are evaluated for all Haar properties that identify the object. This cascade of classifiers enables the accuracy of the classifier to be adjusted and helps to reduce both the false alarm rate and the success rate when there are fewer stages. The opposite is also true. The object detection process involves three main steps: image acquisition, preprocessing, and face detection. The face detection function uses a set of pre-determined Haar cascade samples to identify the driver's face within the captured frames.

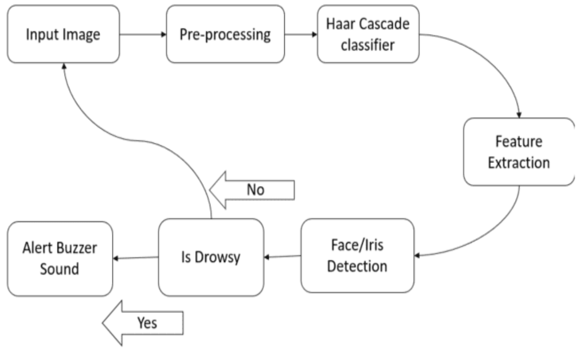

Fig 3. Architecture of Proposed System

VI. IMPLEMENTATION

A. Drowsiness Detection

The goal of driver fatigue detection is to decrease the number of accidents caused by exhaustion by actively tracking a driver's state of consciousness and warning them of potentially dangerous driving situations. Our research involves using a camera to identify specific facial traits or images to detect fatigue. OpenCV will be used to perform the core task of eye detection. The camera will capture live images and videos with its 8-megapixel resolution, and an Arduino Uno R3 board will evaluate the frames collected. The algorithm will be implemented using Python and the Haar cascade classifier, which uses a set of images with positive and negative values to detect objects in computer vision that are near the camera. When a match is found, the classifier will display a red rectangle border around the object. We will also incorporate dib's facial landmark enhancements to enable the sleepy detection feature on the display screen. Our upgraded driver tiredness detection system will monitor the driver's fatigue by identifying eye fatigue through drawing facial landmarks for open and closed eyes and plotting the eye aspect ratio over time. If the eye aspect ratio remains constant, it indicates that the eye is open, but it rapidly drops to nearly zero before rising again, indicating a blink. An alarm will sound if the driver becomes drowsy, taking into account the Haar cascades.

Stepwise Implementation Process of Driver Drowsiness Detection System:

Step 1: Access the device's camera for face detection and import the necessary libraries and their operations. launching the alarm signal for an audio message.

Step 2: Find faces and figure out the aspect ratio according to the Euclidean distance calculation stated before.

Step 3: The primary loop, which reads and stores the camera's settings and distributes the masks to the right and left eyes. The text and audio messages the user will receive warn them when they are getting sleepy.

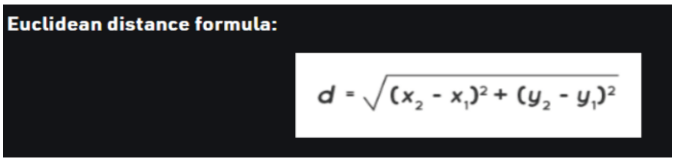

Fig 4. Euclidean distance formula.

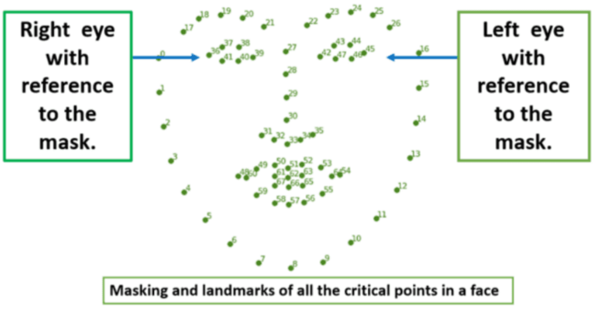

Fig 5. Working function of Eye Blink Detection.

VII. RESULT AND DISCUSSION

By monitoring the driver's facial expressions, eye movements, and other physiological data, such a system can provide early warning signals when signs of drowsiness are detected. This can include audio or visual alerts to prompt the driver to take a break or pull over. By Implementing such a system in vehicles can potentially save lives, reduce the number of accidents caused by drowsy driving, and improve road safety overall. Additionally, it can provide a more reliable and objective method of detecting drowsiness compared to self-assessment by the driver. However, challenges such as variations in lighting conditions and driver position with/without spectacles can impact the accuracy of the system.

VIII. CONCLUSION & FUTURE SCOPE

A. Future Scope

Future research can explore methods for evaluating driver fatigue using external factors such as vehicle status, sleep patterns, weather conditions, and mechanical data. Distracted driving poses a significant risk to highway safety, especially for drivers who operate 24/7, cover high yearly mileage, and work in harsh weather conditions and demanding schedules. To address this safety concern, one preventive measure is to assess the driver's level of alertness and fatigue and provide feedback so that appropriate action can be taken. During camera operation, neither the zoom nor the orientation can be adjusted to balance the trade-off between a wide field of view to locate the eyes and a narrow visual field to detect fatigue.

B. Conclusion

This method allows for instant detection of driver fatigue, even if the driver is wearing contact lenses and driving at night. The monitoring device can accurately determine if the driver's pupils are wide and open, and it can also detect drowsiness through eye movements. If the driver blinks, a warning sound will play, and the vehicle's speed will be reduced while the parking lights are turned on to alert the driver. This safety technology is currently only available in expensive luxury cars, but it has the potential to enhance driver safety and security in ordinary cars through the use of eye-scanning technology.

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