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A Review on Eye Aspect Ratio Technique

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Abstract: *One of the most common factors that contributes to the deaths and injuries caused by road accidents is drowsiness. It can also affect the performance of a driver. Detecting eye blinks is an essential part of various driver safety applications. The rapid pace of blinking makes it incredibly challenging to detect eye blinks automatically. This paper presents a method that can be used to identify eye blinks captured by a camera. The suggested method takes into account the facial landmarks for each frame and then takes the distance between the eyes from these landmarks. The proposed technique calculates the positions of the facial landmarks, uses the Eye Aspect Ratio (EAR) to extract a single scalar quantity, and determines the eye closeness in each frame.*

Keywords: Drowsiness Detection, Eye Aspect Ratio, Facial Landmarks

I. INTRODUCTION

One of the most important factors that jeopardises traffic safety and is linked to catastrophic accidents, fatalities, and financial losses is drowsiness. Driving performance suffers as tiredness increases. Accidents resulting in significant injury or death happen as a result of in attentiveness caused by an involuntary shift from waking to sleep.Eye blinking is influenced by various factors, including eyelid conditions, eye conditions, the presence of disease, the presence of contact lenses, psychological conditions, the surrounding environment, drugs, and other stimuli. The blink rate decreases when driving since it's important to concentrate on the road. The typical blink rate when driving is 8 to 10 blinks per minute. Age, gender, and the amount of time spent blinking all have an impact on a person's blink rate.A very successful method for identifying the blink of an eye using a facial landmark detector with Eye Aspect Ratio (EAR). One easy way is to use the Eye Aspect Ratio (EAR) algorithm. Further, the EAR requires only basic calculations based on the ratio of the distances between the eye's facial landmarks. This eye blink detection method is quick, accurate, and simple to master.

II. LITERTURE SURVEY

[1] Viola et al. conferred an algorithm for object detection, it is uses terribly easy features named Haar. In this algorithm, several numbers of Haar-like features is extracted from the image, and a many effective features are separated to the use in AdaBoost algorithm, then this feature are prepared into a hierarchical data structure same as the decision tree. This algorithm is comparatively quick and robust because of the simple extracted features and choice of the simplest features. This method is amazingly quick and efficient as compared to various strategies.

[2]. Alshaqaqi,et.al Drowsiness detection has many implications including reducing roads traffic accidents importance. Using image processing techniques is amongst the new and reliable methods in sleepy face. The present pilot study was done to investigate sleepiness and providing images of drivers' face, employing virtual-reality driving simulator. In order to detecting level of sleepiness according to the signal, information related to 25 drivers was recorded with imaging rate of 10 fps. Moreover, on average 3000 frames were analyzed for each driver. The frames were investigated by transforming in grey scale space and based on the Cascade and Viola & Jones techniques and the images characteristics were extracted using Binary and Histogram methods. The MPL neural network was applied for analyzing data.70% of information related to each driver were inserted to the network of which 15% for test and 15% for validation. In the last stage the accuracy of 93% of the outputs were evaluated. The intelligent detection and usage of various criteria in long-term time frame are of the advantages of the present study, comparing to other researches. This is helpful in early detection of sleepiness and prevents the irrecoverable losses by alarming.

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[3]. SaravanarajSathasivam proposed a drowsiness detection system based on EAR. The system function is to detect eye's location from captured images and determine the value of EAR. In this method each eye is labelled with 6 (x, y) coordinates in landmarks retuned Dlib predictor function. The labelling beginning at the left corner moving clockwise around the remainder of the area. However, there is a connection between how far apart the coordinates are. So, it generates an equation, the attention ratio is another name for EAR. Based on the experimental outcomes, it is able to recognize people who are drowsy.

[4]. Fouzia, Roopalakshmi R, Jayantkumar A Rathod, Ashwitha S Shetty, Supriya k proposed a driver drowsiness detection system which makes use of eye blink counts for detecting the drowsiness. It continuously monitors the driver's eye movement, and when it detects drowsiness, it activates the vibrator to warn the driver. When the eyes were detected closed for too long, a warning signal is issued. This was done by mounting a camera in front of the driver and continuously capturing its real-time video using Open CV in Raspberry Pi. After the eye area detected the camera will capture the eye of the driver it will count the eye blink. The eye detection algorithm only detects the eyes if they were opened, this will help in detecting the driver's drowsiness.

[5]. C.Murukesh usedcomputer vision to suggest a non-intrusive method of detecting driver drowsiness. algorithm is written in the Linux system using the OpenCV platform. Blinking, eye closure, gaze, and facial and eye detection are among the indicators of drowsiness. A camera with night vision is used to record input and live feed it. The algorithm is Haar trained to detect the face and the eye from the incoming frame. Further coding is done to follow the eye and automatically set a dynamic threshold value after the eye is recognized. Eyelid closure/blink/gaze is detected based on the values acquired from each of the incoming frames and deviations from the threshold values. The purpose of a warning system is to alert the driver. Road accident problems are effectively solved by this approach.

III. DRIVER DROWSINESS DETECTION TECHNIQUEUSING EAR

Eye closure is detected by estimating EAR from the face detected using facial landmark detector.

The Eye Aspect Ratio, or EAR, is a scalar value that responds, particularly for opening and closing the eyes.

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

||p2-p6|| means the distance between points p2 and p6

The numerator of this equation is the distancebetween the vertical eye landmarks while the denominator isthe distance between horizontal eye landmarks. It contains P1,P2, P3, P4, P5 and P6. When the eye is open, the EAR is practically constant, but when the eye blinks, it quickly drops to zero.

The more the EAR, the more widely eye is open. We would decide a minmum EAR value and used this to decide if the eye is closed or not.

When EAR goes below threshold , drowsiness is confirmed and driver is alerted.

IV. DRAWBACKS OF USING EAR

- As a result of wearing glasses, the system may incorrectly identify the driver's eyes and fail to recognise them.. This is due to short-sighted problem. In order to solve this issue, the system must process more examples of images with glasses.
- When adopting an image-based technique for the system, the illumination is the primary restriction.In order to get around this restriction, LED are used. But LEDs are less useful during the day. The infrared camera can be used at night.

V. CONCLUSION

This research suggests an EAR-based sleepiness detection system. The system's function is to locate eyeballs from photos and determine the value of EAR. In this approach. The landmarks returned Dlib predictor function labels each eye with coordinates. Beginning at the left-corner of the focus, the labelling moves clockwise around the remaining area. There is a relationship between the coordinates' distances in the meantime. As a result, an equation for this

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relationship known as the attention ratio, often referred to as the eye aspect ratio, is derived (EAR). The drowsiness detection technique can be further improved by calculating the yawn detection, nodding , face orientation rather than just depending on the eye closure status which helps to detect drowsiness more accurately.

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