An Intelligent Alarm System for Drivers Drowsiness Detection

Dharani N[1], Dharanidharan G[2]

[1]*Student, Dept. of ECE, Bannari Amman Institute of Technology, Tamilnadu, India*
[2]*Student, Dept. of ECE, Bannari Amman Institute of Technology, Tamilnadu, India*

Abstract - *Our wellbeing is the need while traveling or driving. One mix-up of the driver can prompt serious wounds, deaths, and huge financial misfortunes. These days there are numerous frameworks accessible in the market like navigation frameworks, different sensors, and so on to make driver's work simple. There are different reasons particularly human blunders which offer ascents to road accidents. Reports say that there is an enormous addition in road accidents in our country over the most recent couple of years. The fundamental explanation happening from highway accidents is the laziness and sleepiness of drivers while driving. It is a vital advance to accompany a productive method to recognize drowsiness when the driver feels sleepy. This system is used to check the fatigue by monitoring the facial expressions of the drivers using image processing techniques and generating a warning when a driver is detected drowsy.*

Key Words: **Accident, Drowsiness, Facial expressions, Image Processing, Warning.**

1.INTRODUCTION

Every year many individuals lose their lives because of car crashes throughout the planet. The job of the human factor in accidents can't be ruled out; According to public measurements, 90 to 95 percent of automobile crashes in India, the human factor assumes a vital part. When all is said in done, driver exhaustion represents 25% of accidents and around 60% of road accidents bring about death or genuine injury. In an investigation by the National Transportation Research Institute (NTSRI) in which 107 random car accidents had been selected, fatigue accounted for 78% of all accidents. A main cause of fatigue is sleeplessness or insomnia. Ad hoc networks were the first systems to develop automatic navigation in cars. It is particularly significant in driving where time is a basic factor in a driver's choice. On the other hand, another method to check driver fatigue is monitoring the physical condition and facial expressions of the drivers using image processing techniques and generating a warning when a driver is detected drowsy.

1.1 Literature Survey

1) A Dedicated System for **Monitoring of Driver's Fatigue** K.SubhashiniSpurjeon, Yogesh Bahindwar: In this paper author portrays a constant framework for dissecting video groupings of a driver and deciding the degree of consideration. For this reason, the author utilizes the calculation of percent of eyelid conclusion.

2) **Drowsiness Warning System** Using Artificial Intelligence, Nidhi Sharma, V. K. Banga. In this paper, the author talks about the different computerized reasoning strategies for distinguishing the laziness of the framework.

3) The Hakim Sabzevari University of sabzevar distributed a paper on the **Real-Time Intelligent Alarm System of Driver Fatigue Based on Video Sequences**. The goal was to record the video grouping of the driver's and picture handling methods. The procedure included was the Skin division Viola-Jones calculation.

4) Establishment of Computer Science FCS, New York, USA, distributed a paper on **Drowsiness Detection dependent on Eye Movement**. The method included was the Haar classifier.

1.2 Existing Methodologies

A variety of drowsiness detection methods exist that monitor the drivers' drowsiness state while driving and alarm the drivers if they are not concentrating on driving. The relevant features can be extracted from facial expressions such as yawning, eye closure, and head movements for inferring the level of drowsiness.

1.2.1 Drowsiness detection based on controller:

In this method, the driver's eye tiredness is distinguished and alert the driver, likewise to stop the vehicle consequently if the driver doesn't give a reaction to the caution. For this, the camera is fixed on the vehicle that concentrates straight towards the essence of the driver and checks the driver's eyes with a particular ultimate objective to perceive laziness utilizing MATLAB. An alarm is given to alert the driver, in such a circumstance when sleepiness is perceived. If a driver doesn't give a reaction to the bell implies, the regulator will stop the vehicle. For this pic, the microcontroller is utilized.

1. Hardware Requirement:

- ✓ PIC microcontroller
- ✓ Camera
- ✓ Buzzer
- ✓ Relay & Two-axis Robot

2. Software Requirement:

- ✓ Embedded C
- ✓ MATLAB R2021a

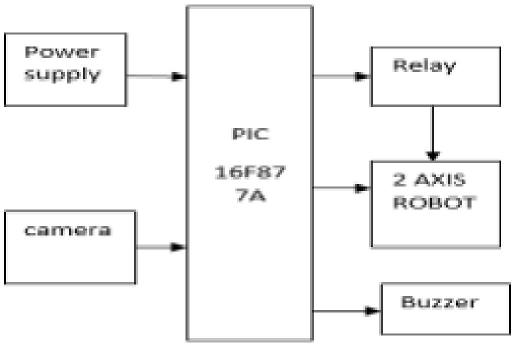

Fig -1: Block diagram of drowsiness detection based on a controller.

1.2.2 Drowsiness detection based on PERCLOS Monitor:

PERCLOS is a drowsiness detection measure, referred to as the percentage of eyelid closure over the pupil over time and reflects slow eyelid closures or droops rather than blinks. Different continuous administrator languor location frameworks use PERCLOS appraisal and propriety-created programming to decide the beginning of weariness. Every technology developer utilizes a novel set-up and mix of equipment to improve the precision and capacity to follow eye development, eyelid conduct, head, and face presents under every single imaginable condition.

A few frameworks depend on a camera module on a rotating base that is mounted on the dashboard inside the taxi. The gadget has an enormous field of view to oblige driver head developments. The hardware utilizes eye-following programming with an organized light methodology that relies upon the high differentiation between the understudies and the face to recognize and follow the administrator's students. On the other hand, adaptable and versatile global positioning frameworks give head and face following which incorporates eye, eyelid and look following. These frameworks presently give continuous criticism without the utilization of wire, magnets, or headgear. Even though reviews affirmed a connection amongst PERCLOS and hindrance, a few specialists are worried by the impact which eye conduct random to exhaustion levels may have on the precision of estimations. Residue, lacking lighting, glare, and changes in moistness are non-weariness-related components that may impact administrator eye conduct. This framework may consequently be inclined to higher paces of bogus cautions and missed examples of debilitation.

$$\text{Perclos (\%)} = \frac{\text{sum of frames when eyes are closed} * 100\%}{\text{Interval of frames}}$$

Fig -2: PERCLOS monitor.

1.2.3 Drowsiness detection based on a combination of Smartwatch, EEG signal, and PERCLOS Monitor:

Chung has proposed a smartwatch, a PERCLOS, and a headband containing sensors to recognize drowsy. Numerous physiological signs have been proposed to recognize driver sleepiness. Among these signs, an electroencephalographic (EEG) signal, which reflects mind exercises, is all the more straightforwardly identified with tiredness. Consequently, numerous EEG-based driver laziness identification models acquired and more consideration lately. This model proposes a help vector machine-based back probabilistic model (SVMPPM) for sluggishness identification, pointed toward changing the laziness level to any worth of 0~1 rather than discrete marks. A completely wearable EEG framework that comprises a Bluetooth-empowered EEG headband and a business smartwatch was utilized to assess the proposed model continuously.

Fig -3: Chung proposed model

2. SYSTEM OVERVIEW

The proposed framework chiefly includes getting the video of the Automobile driver. It tends to be gained with the assistance of a camera. Every video contains numerous quantities of frames. The first process involves frame separation. After that, the face region is found by applying Viola-Jones calculation which utilizes Vision.CascadeObjectDetector. When the face region is discovered, the eyes and mouth are found by figuring the even midpoints around there. The framework manages to utilize data got for the paired rendition of the picture to discover the edges of the face, which limits the space of where the eyes may exist and finds the situation of the mouth. If the eyes are closed for more than 5 successive edges, and the mouth is opened in 5 back to back outlines the system concludes that the driver is falling asleep and issues a warning signal.

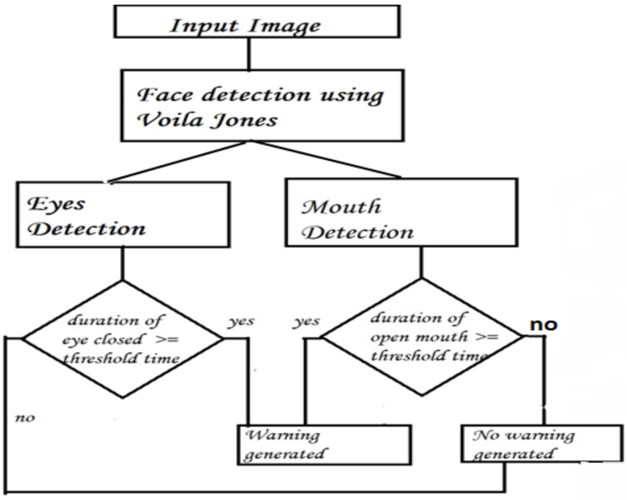

Fig -3: Block diagram of the proposed model

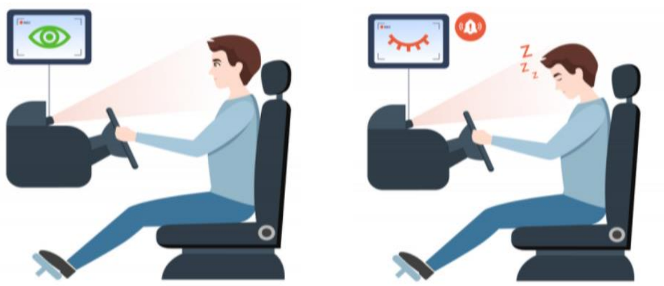

Fig -4: Diagrammatic representation of the model

2.1 Image Acquisition

Image Acquisition chiefly includes acquiring the picture of the Automobile driver. It can be obtained with the assistance of a camera by jumping into various casings. The live image is taken as its input and then it converts those images into a series of images which further proceed to make various operations.

2.2 Face Detection

The Viola–Jones object detection framework is the primary article discovery system to give serious item identification rates continuously proposed in 2001 by Paul Viola and Michael Jones. In spite of the fact that it may be prepared to identify an assortment of article classes, it was inspired basically by the issue of face location. In the discovery period of the Viola-Jones object detection framework, a window of the objective size is moved over the picture, and for every subsection of the picture, the Haar-like component is determined. This distinction is then contrasted with a learned limit that isolates non-objects from objects. Since such a Haar-like component is just a feeble student or classifier (its identification quality is somewhat better compared to arbitrary speculating) an enormous number of Haar-like highlights are important to depict an item with adequate precision. In the Viola–Jones object discovery system, the Haar-like highlights are hence coordinated in something many refer to as a classifier course to frame a solid student or classifier.

Fig -5: Face detection after the viola-jones algorithm

2.3 Eyes Detection

After the face is distinguished utilizing Voila-Jones, the area containing the eyes and mouth must be isolated. To detect the coordinate from where the region of the eye is starting certain calculations are done. After the rectangular window is extracted, we have thought that the eyes are situated a good way off of (0.25 * height of window) from the top and (0.15 * width of the window) from the left. The size of the window is (0.25 * height of window) in stature and (0.68 * width of the window) in width. After the eyes are trimmed the picture is changed over to YCbCr. The justification changes and the best approach to change over are referenced in the "Skin Segmentation" section. At that point, the picture is changed over to grayscale and eventually to the twofold picture by setting an edge of (least pixel esteem + 10).

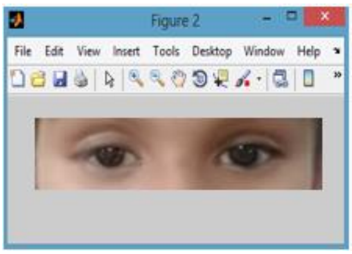

Fig -6: Cropped eye region

2.4 Mouth Detection

To detect the coordinate from where the region of mouth is starting certain calculations are done. After the rectangular window is removed, we have thought that the mouth is situated a good way off of (0.67 * height of window) from the top and (0.27 * width of the window) from the left. The size of the window is (0.20* height of window) in height and (0.45 * width of the window) in width. Again, the mouth is changed over to YCbCr shading space, at that point, it is changed over to the grayscale picture and thusly, changed over to a twofold picture with a limit of (least pixel esteem + 10).

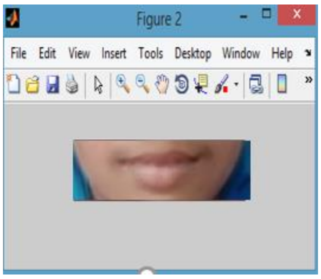

Fig -7: Cropped mouth region

2.5 Generate Warning

After eyes and mouth are detected, the system continuously loops through the frames and checks for drowsiness. If the eyes are closed for more than 5 consecutive frames or if the mouth is opened for more than 5 consecutive frames the systems conclude that the person is drowsy and also it generates a warning sound that alerts the driver.

3. CONCLUSION

In the proposed framework driver drowsiness detection framework dependent on eye closing and opening of the mouth utilizing picture preparing is proposed. Three calculated plans were created with various ways to deal with distinguishing tiredness, including facial highlights, yawning, eye blinking and shutting of the eye, the opening of the mouth. This could contribute to the development of a non-intrusive and highly effective driver drowsiness detection system.

3.1 Scopes

- It helps in avoiding accidents and gives warning to the driver about their fatigue.
- It processes the video in less time.

3.2 Limitations

- Objects in the video should be uniformly illuminated, else results can differ.
- Changing the distance of a person from the camera can cause problems.
- The algorithm doesn't work for the people sleeping with their eyes open.

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