AI Based Smart Assistant System for Drowsiness Driver

Dinesh.C, Jayasreedhar.N, Lankesh.P, Mugilan.S, Karthikeyan.S

{dineshchml@gmail.com[1], sreedharneymar11@gmail.com[2], lankiprad@gmail.com[3], sureshmugilan330@gmail.com[4], arktechautomation@gmail.com[5]}

[1]Assistant Professor, Department of Electrical and Electronics Engineering, KPR Institute of Engineering and Technology, Coimbatore, Tamil Nadu, India-641407

[2, 3 & 4] UG student, Department of Electrical and Electronics Engineering, KPR Institute of Engineering and Technology, Coimbatore, Tamil Nadu, India.641 407.

[5]Managing Partner, ARK Automation Pvt Ltd., Coimbatore - 641029

Abstract. Virtual Assistant is an artificial intelligence-based technology. It was created to assist users with their fundamental chores and offers information in a natural language way. When a user requests that his assistant complete a task, the native language voice stream is translated into digital data that the software can interpret consumers to get the values of specific devices from the system. Many accidents are caused by drivers who are drowsy. It is becoming one of the leading causes of traffic accidents. According to recent statistics, many accidents are caused by drivers who are drowsy. Thousands of lives are lost each year as a result of vehicle accidents caused by drowsy drivers. Drowsiness is responsible for more than 30% of all accidents. To avoid this, a system is needed that detects drowsiness and alerts the driver, saving the driver's life. We describe a strategy for detecting driver tiredness in this research. The motorist is continuously monitored via camera in this scenario. This model employs image processing algorithms that are primarily focused on the driver's face and eyes.

Keywords: Driver Drowsiness, Face Detection, Perclos, Virtual assistant

1 Introduction

Driver drowsiness is a major factor in the majority of traffic accidents. Drowsiness endangers road safety and can result in serious injuries, leading to the victim's death and financial losses. Drowsiness is defined as a feeling of being weary, a loss of attention, or tired eyes when driving a vehicle. In India, the majority of accidents are caused by a driver's lack of concentration. Due to tiredness, the driver's performance steadily deteriorates. To avert this occurrence, we created a system that can detect the driver's tiredness and inform him promptly. This system uses a camera to record images as a video stream, recognises the face, and locates the eyes. Perclos is then used to analyse the eyes for sleepiness detection.

Drowsiness is one of the leading causes of car accidents, and an alert system could assist to prevent them. Drowsiness detection is a safety feature that can help prevent accidents caused by drivers who have fallen asleep behind the wheel. According to a poll, drowsy driving is

ITSPWC 2022, May 14-15, Karur, India

DOI 10.4108/eai.14-5-2022.2318878

responsible for 20% of all traffic accidents. This turns out to be a significant issue, not only for the driver but also for other road users. This drowsy alarm system is a safety device that notifies the driver if he becomes drowsy. This category includes determining the driver's weariness without the use of non-invasive devices. Analyzing the driver's behaviour by looking at his or her eye closure ratio, blink frequency, yawning, head position, and facial expressions. The current parameter in this system is the driver's eye-closure ratio. This topic includes determining a driver's fatigue level based on vehicle driving behaviours. Lane change patterns, steering wheel angle, steering wheel grip force, vehicle speed variations, and a variety of other characteristics are among these.

Each of the options listed above has its own set of benefits and drawbacks. Any strategy can be employed depending on the desired outcome accuracy. Wearing the device on the driver's body is part of the physiological approach. Electrodes that detect the driver's pulse rate are included in this equipment, which may make the driver feel uneasy while driving. This also doesn't guarantee that the driver is constantly wearing such gear when driving, which could lead to ineffective results. As a result, employing the physiological method presents a challenge. The efficiency of the driver and his condition are constantly considered in a vehicle-based approach. There are further limits such as the state of the road and the type of vehicle, both of which can vary on a frequent basis. The main goal of this project is to create a prototype of a driver drowsiness system that notifies the driver when he is sleepy or drowsy. This is accomplished by utilising a machine learning model to detect the driver's face using a camera and analysing the driver's state.

When the driver is not there, ordinary braking is insufficient to prevent accidents. The braking system must be improved further in order to brake a vehicle when the driver is unable to do so, which may necessitate the use of an automatic braking system. The vehicle can brake without the driver's assistance using this autonomous braking technology.

2 Problem Statement

Many traffic accidents occur as a result of the driver's tiredness. Drowsiness can be identified by keeping a constant video stream on the driver's phone or webcam. The overall goal is to develop a model that can detect whether or not a person is drowsy. The model takes an image every second, checks for eye blinking, and uses the perclos algorithm to compute the time it takes for the eye to close. If the blinking rate is high and the eye is closed for a long period of time, the driver will be alerted by a sound.

3 Block Diagram

The image of the driver will be capture by the webcam for the face detection purpose. Then the face can be detected using the HAAR cascade algorithm. When this algorithm is succeed then it will check two concerns, they are face analysis for continuous gazing and eye detection for blink frequency. If the algorithm is not succeed again it will return to the origin state. Then the face analysis for continuous gazing will check whether the driver is distracted or not. If the driver gets distracted the alarm will be activated and the braking system is applied. Also, on other side driver's eyes where, analyzed using perclos algorithm, which this algorithm will check the drowsiness in eyes, whether the eyes are drowsy then the alarm is activated and the braking system is applied. If the eyes are not drowsy it again moves to origin state.

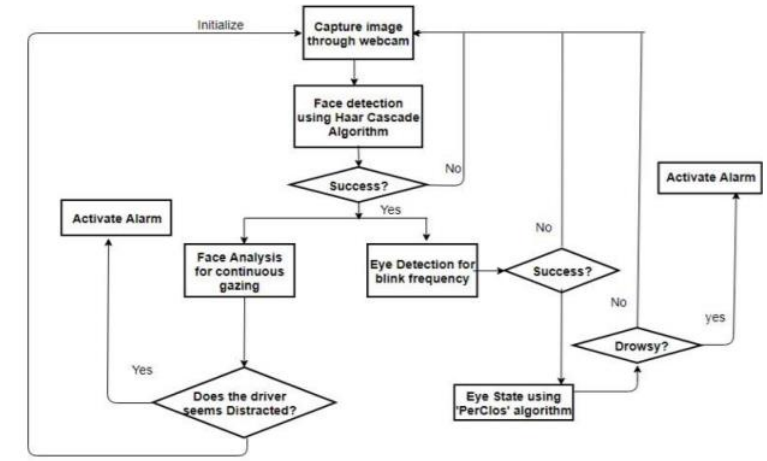

Figure 1: Block Diagram

4 Components

The components used in the AI based assistant system for driver drowsiness system requires:

- Python IDE
- Open CV
- SciPY
- Imutils
- Declaration Process

Python IDE:
The acronym IDE refers to the Integrated Development Environment. It's a coding tool that makes it easier to develop, test, and debug your code by providing features such as code completion, code insight through highlighting, resource management, debugging tools, and so on. Even though the IDE is a well-defined concept, it's beginning to be redefined as alternative tools, such as notebooks, obtain more and more functions that were previously reserved for IDEs. Debugging your code, for example, is also available with Jupyter Notebook.

Open CV:
Open CV is a large open-source library for image processing, computer vision, and machine learning. Python, C++, Java, and other programming languages are supported by Open CV. It can analyse photos and videos to recognise items, faces, and even human handwriting.

SciPY:
SciPy is a Python open-source library for addressing issues in mathematics, science, engineering, and technology. It gives users the ability to alter and view data using a variety of high-level Python commands. SciPy is based on the NumPy Python extension. "Sigh Pi" is another way of pronouncing SciPy.

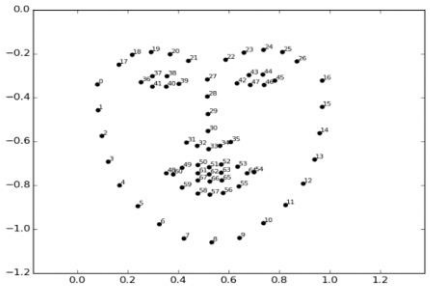

Figure 2: SciPY

Imutils:
Imutils are a set of convenience functions for Open CV and Python 2.7 and Python 3 that make basic image processing functions including translation, rotation, scaling, skeletonization, and presenting Matplotlib pictures easier.

Deceleration Process:
The servomotor is servomotor over a stepper motor is that it can rotate at any angle and, unlike a stepper motor, can hold a constant position without moving. The most important part of the braking system. The brake pedal has a servomotor mounted on it.

5 Simulation and Analysis

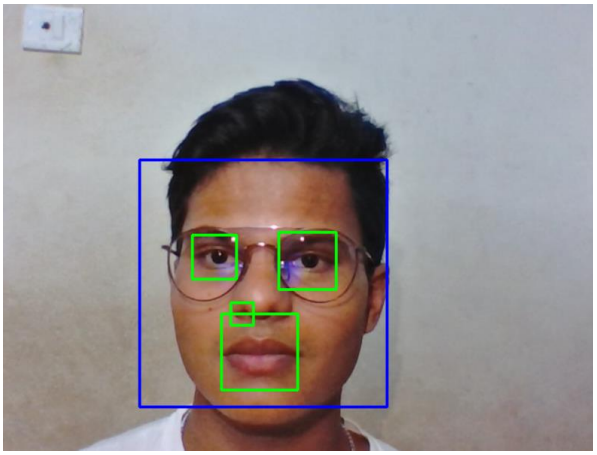

Figure 3: Simulation1

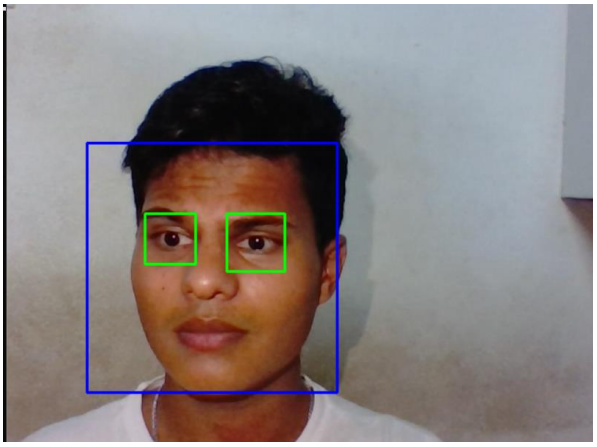

Figure 4: Simulation2

This stimulation modeling is done by Dlib software. Which it can identify the drowsiness or any change in master image. The 68 points are clearly identified in the stimulation. The eye aspect ratio is calculated in the Dlib software.

6 Result and Discussion:

The Table shows the eye state whether it is closed or open. This can be identified by using Dlib software.

	Total Frames	Eyes Open	Eyes Closed	Correct Rate
Seq. 1	060	600/700	258/260	08.00%
Seq. 2	900	520/560	339/340	96.27%
Seq. 3	500	388/400	99/100	98.00%
Seq. 4	330	150/170	152/100	91.01%

Figure 5: Table of eye state

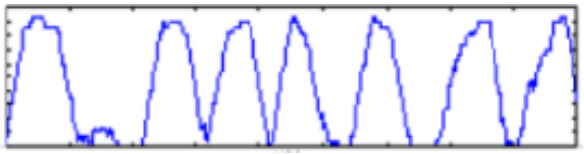

Figure 6: Result Graph of Perclos

7 Conclusion

This sleepiness detection technology is less accurate in identifying the driver's drowsiness. Image processing sensors can be utilized to detect by studying the facial muscles, and broad range infrared sensors can expand the horizontal width of detection if the driver moves by a small angle to improve the accuracy of the drowsy state prediction. The use of this advanced sleepiness detecting technology will provide more benefits in the future, and life loss will be prevented to a greater level.

This is the most effective strategy to avert accidents and save people's lives. To identify tiredness, we built a system that locates and follows the driver's eyes. The technology will be able to determine whether the eyes are open or closed when tracking. When the eyes are closed for an extended period of time, a warning signal is delivered in the form of a buzzer or alert, and if an accident occurs, a message is sent to an emergency number such as 911, specifying the position coordinates and blood group of the driver.

References

[1] P. Viola and M. Jones, "Rapid Object Detection using a Boosted Cascade of Simple Features", in Proceedings of the IEEE Computer Society Conference on Computer Vision and Pattern Recognition, 2001.
[2] R. Lienhart and J. Maydt, "An Extended Set of Haar-like Features for Rapid Object Detection", in Proceedings of the IEEE International Conference on Image Processing, 2002.
[3] OpenCV. Open Source Computer Vision Library Reference Manual, 2001.
[4] B. Bhowmick and C. Kumar, "Detection and Classification of Eye State in IR Camera for Driver Drowsiness Identification", in Proceeding of the IEEE International Conference on Signal and Image Processing Applications, 2009.
[5] N. Otsu, "A Threshold Selection Method from Gray-Level Histograms", IEEE Transactions on Systems, Man and Cybernetics, pp. 62-66, 1979.
[6] Z. Tian et H. Qin, "Real-time Driver's Eye State Detection", in Proceedings of the IEEE International Conference on Vehicular Electronics and Safety, October 2005.
[7] Fletcher L., Petersson L. and Zelinsky A.: Driver Assistance Systems based on Vision In and Out of Vehicles. IEEE Proceedings of Intelligent Vehicles Symposium, pp. 322-327, (2003).
[8] Bergasa L., Nuevo J., Sotelo M. and Vazquez M.: Real Time System for Monitoring Driver Vigilance. IEEE Intelligent Vehicles Symposium (2004).
[9] Dwipjoy Sarkar, Atanu C, Real Time Embedded System Application for Driver Drowsiness and Alcoholic Intoxication Detection, IJETT, Volume 10 Number 9, April 2014.
[10] Tianyi Hong, Huabiao Qin, Drivers Drowsiness Detection in Embedded System., IEEE, December 2007.
[11] Rinivasu Batchu, S Praveen Kumar, Driver Drowsiness Detection to Reduce the Major Road Accidents in Automotive Vehicles, IRJET, Volume 02 Issue 01, April 2015.
[12] Lorraine Saju, Christeena J, Farhana Yasmin, Surekha Mariam, Drowsiness detection system for drivers using HAART training and template matching, IJEAST, Vol. 1, Issue 6, April 2016.
[13] Fouzia, Roopalakshmi R, Jayant Kumar A Rathod, Ashwitha S, Supriya K, Driver Drowsiness Detection System Based on Visual Features. , IEEE, April 2018.
[14]SaeidFazli, Parisa Esfehani, Tracking Eye State for Fatigue Detection, ICACEE, November 2012. Gao Zhenhai, Le DinhDat, Hu Hongyu, Yu Ziwen, Wu Xinyu, Driver Drowsiness Detection Based on Time Series Analysis of Steering Wheel Angular Velocity, IEEE, January 2017.
[15] Kyong Hee Lee, Whui Kim, Hyun Kyun Choi, Byung Tae Jan. A Study on Feature Extraction Methods Used to Estimate a Drivers Level of Drowsiness, IEEE, February 2019.