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A Paper on Drivers Somnolence Recognition System (DSRD)

Omprakash Barapatre[1], Rimjhim Manu[2], Sahil Raju[3], Rahul Verma[4]

[1]Assistant Professor, Bhilai Institute of Technology, Raipur, Chhattisgarh, India
[2,3,4]Student, Bhilai Institute of Technology, Raipur, Chhattisgarh, India

A B S T R A C T

This study showcases the creation of a DSRS that specifically targets the identification of driver fatigue. The main aim of this system is to notify drivers when they feel drowsy in order to prevent accidents on the road. In a driving setting, it is important to detect fatigue in a way that does not invade the driver's privacy or inconvenience them with unnecessary alerts when they are not feeling sleepy. We tackle this unresolved issue by utilizing image sequences that are 60 seconds in duration and captured in a manner that ensures the subject's face is apparent. Two different approaches have been created to determine if the driver exhibits signs of sleepiness or not, with an emphasis on reducing the occurrence of incorrect identifications. The initial option employs a combination of a recurrent and convolutional neural network (CNN), whereas the subsequent option utilizes deep learning methods to derive numerical characteristics from images. This has the accuracy of 90%.

In this paper, we explain the need of this particular system, the advancements made in it and all the advantages and disadvantages of the system.

Keywords: DSRD, drowsy, CNN, deep learning

1. Introduction

The word “Somnolence” means “Drowsiness”. In recent times, motorist doziness has been one of the major causes of road accidents and can lead to severe physical injuries, death and significant profitable losses. According to a report 40% of the road accidents are taking place due to the sleep deprived drivers on the road.

The characteristics of the crashes caused by tired drivers can be described in several ways. Happen in the early hours of the morning (12:00 am - 7:00 am) or in the middle of the afternoon (2:00 pm - 4:00 pm). Include a scenario where only one vehicle veers off the road. Happens on fast-moving streets. The driver is frequently by themselves. Typically, the driver is usually a young man in the age range of 16 to 25. There were no signs of tire friction or evidence that the brakes were applied. In regards to these attributes, the databases utilized by Southwest England and the Midlands Police employ the subsequent factors to determine accidents resulting from sleepiness. The blood alcohol concentration is lower than the legal threshold for driving. The car veered off the road or collided with the rear of another vehicle. There is no indication that brakes were used. The vehicle is free from any mechanical issues. The weather is favorable and there are no obstructions to visibility. Exclusion of "exceeding the speed limit" or "following the vehicle in front too closely" as potential factors

Statistics indicate the need of a dependable motorist doziness recognition system which could warn the motorist before a mishap happens. Experimenters have tried to determine motorist doziness using the following measures (1) vehicle- grounded measures; (2) behavioral measures and (3) physiological measures.

1.1. Signs and stages of drowsiness:

Stage I: Moving from being awake to being asleep (feeling drowsy)

Stage II: Shallow slumber.

Stages III: Profound slumber Researchers have primarily focused on investigating Stage I, which refers to the phase of drowsiness, for the examination of driver drowsiness.

2. Literature Review

The main concept of the previous system was to use the camera module to detect the moment of eyes. It used the concept of frames to check whether the eyes are closed or open, also to instruct the buzzer to turn on and alert the driver. The number of frames that has been earlier use were 30-40.

3. Problem Statement

The main problem to be dealt in the previous projects is the problem of accuracy. Earlier the accuracy of the project was detected to be 80%.

This project deals with the required problem of accuracy. Here we try to make a project that is purely based on the camera module and also that works towards the increasing of the accuracy by at least 10%. Through this project we expect to have increased safety and accuracy of the system.

4. Methodology

In this Methodology some steps have been followed to reach our results, they are as follows:

Step 1: Start of camera.

Step 2: Here the camera starts to calculate the frame and starting to extract different frames.

Step 3: After the face has been detected the detection of the eyes begin.

Step 4: After the detection of the eye the camera detects whether the eye was close or not if yes then for how many seconds, if the eyes is closed for at least 3 seconds the it will start the alarm also the hazard lights of the vehicle. If it's not then the eye detection continues.

In this model this EAR method is used that is based on eye blinking. In this eye blinking price and eye closure period is measured to hit upon driving force's drowsiness. Because when driving force felt sleepy at that point his/her eye blinking and gaze among eyelids are exclusive from everyday conditions so they without difficulty hit upon drowsiness. In this device the placement of irises and eye states are monitored via time to estimate eye blinking frequency and eye near period. And in this form of device makes use of a remotely positioned digital digicam to gather video and pc imaginative and prescient techniques are then applied to sequentially localize face, eyes and eyelids positions to degree ratio of closure. Using those eyes nearer and blinking ration you can hit upon drowsiness of driving force. Such a device, set up in a discreet nook of the car, could screen for any symptoms and symptoms of the top tilting, the eyes drooping, or the mouth yawning simultaneously. The following figure indicates the attention blink detection.

When it comes to the detection of blinking, our focus is solely on two specific facial features, which are the eyes.

$$EAR = \frac{\|p2 - p6\| + \|p3-p5\|}{2\|p1-p4\|}$$

The 2D facial landmark locations are represented by p1, …, p6. The top number in this equation calculates the distance between the vertical eye landmarks, while the bottom number calculates the distance between the horizontal eye landmarks. The bottom number is given more weight because there is only one set of horizontal points compared to multiple sets of vertical points. What makes this equation so intriguing? So, as we will discover, the proportion of attention remains constant when the attention is open but quickly drops to zero during a blink. By employing this simple formula, we can avoid utilizing complex image processing techniques, relying instead on the eye landmark distances ratio to determine if a person is blinking.

5. Implementation

We have used the software pycharm and following are the steps we have performed:

- In the code first we are importing the required libraries.
- Then we are using the function called mixer.sound that imports the sound file.
- Next, the cascade files for face detection, right and left eye detection is imported. It has predefined face detection point to detect the face.
- We have the model call cnncat2 that contains a code to detect the opening and the closing of the right and the left eye using the EAR.
- Next, the cap is used to capture the video for the frame extraction. The cap.Videocapture(0) represents that the laptop camera is in use currently.
- Here, the font size to be shown on the window, line 19 is foe the frame & line 20 is for the thickness of the frame.
- Next, we define a function called frames in which according to the global frame thickness we include a while loop in line 26 that contains two functions called RET and frames that reads the captured video
- Next, we are reading the cascade files and the addresses inside it.
- We start a loop and define two functions, i.e., roi_gray & roi_colour.

- Next, we detect the left eye.
- Further, we detect the right eye,
- This function defines the names like Open Eye & Closed eye.
- Next, we define a wait key that tells how much time to wait to switch on the buzzer after the closed eye detection.
- Now, the code is to detect the drowsiness of the driver if detected it should be displayed with the buzzer turning on.
- The function processing_thread reads the features of the face.
- Now, we star a loop that contains the wait key fir the face detection.
- At the last we have finished the function or closed the functions.

6. Conclusion

The main aim of our project was to increase the accuracy of the camera base drowsiness detection. Here the frame number of frames has decreased from 30 – 40 to just 15-20, this has made our project more accurate and increased our accuracy to 90%.

The detection is based on the movement of eyes. If any time the eyes of driver are closed for approx. 3 second then the buzzer will turn on and keeps nuzzling until and unless the driver opens his/her eyes properly. The buzzer keeps buzzing for next 3 seconds after the eyes are open.

We conclude that the main aim of this project has been fulfilled.

References

[1]. Paulo Augusto de Lima Medeiros, Gabriel Vinícius Souza da Silva, Felipe Ricardo dos Santos Fernandes, Ignacio Sánchez-Gendriz, Hertz Wilton Castro Lins, Daniele Montenegro da Silva Barros, Danilo Alves Pinto Nagem, Ricardo Alexsandro de Medeiros Valentim, "Efficient machine learning approach for volunteer eye-blink detection in real-time using webcam", ELSEVIER, Volume 188, February, 116073, 2022.

[2]. Lu Youwei," Real-time eye blink detection using general cameras: a facial landmarks approach", International science journal of engineering and agriculture, Vol. 2, No. 5, October,1-8. doi: 10.46299/j.isjea.20230205.01, 2023.

[3]. Filippo Attivissimo a, Vito Ivano D'Alessandro a, Attilio Di Nisio a, Giuliano Scarcelli b, Justin Schumacher b, Anna Maria Lucia Lanzoll, "Performance evaluation of image processing algorithms for eye blinking detection", ELSEVIER, Volume 223, December, 113767, 2023.

[4]. P. Kowalczyk, D. Sawicki, "Multimedia Tools and Application", Springler Link, Volume 78, 2018,13749-13765.

[5]. S. Al-Gawwam, M. Benaissa," Robust eye blink detection based on eye landmarks and Savitzky-Golay filtering", MDPI, Information 2018 Volume 9, April, 2018.

[6]. Adil Ali Saleem, Hafeez Ur Rehman Siddiqui, Muhammad Amjad Raza, Furqan Rustam, Sandra Dudley & Imran Ashraf , "A systematic review of physiological signals base driver drowsiness detection system ", Springler Link, Volume 17, October, 2022.

[7]. Islam A. Fouad, "A robust and efficient EEG-based drowsiness detection system using different machine learning algorithms", Ain Shams Engineering Journal, Volume 14, April,101895, 2023.

[8]. Ajinkya Rajkar, Nilima Kulkarni & Aniket Raut, "Drivers Drowsiness Detection Using Deep Learning", Springler Link, Volume 1357, July, 73-82, 2021