IJRAR.ORG E-ISSN: 2348-1269, P-ISSN: 2349-5138

INTERNATIONAL JOURNAL OF RESEARCH AND ANALYTICAL REVIEWS (IJRAR) | IJRAR.ORG

An International Open Access, Peer-reviewed, Refereed Journal

ADAPTIVE DROWSINESS DETECTION USING MACHINE LEARNING ALGORITHM

P K Ghibitha Bebin

Department of Electronics and Communication Engineering
Sri Ramakrishna Institute of Technology, Coimbatore, Tamilnadu, India

Dr A N Jayanthi

Department of Electronics and Communication Engineering
Sri Ramakrishna Institute of Technology, Coimbatore, Tamilnadu, India

Abstract- Fatigue and drowsiness of driver are amongst the most significant cause of road accidents. The main aim of the project is to find out the methods to detect driver drowsiness and alerting them, hence increasing the transportation safety. In this proposed system, capturing face gestures, eye movements and eye aspect ratio (EAR) shows that driver is in proper driving condition or not. Driver fatigue can increase the chances of car accidents. The reason for this type of car accidents is due to the fact that driver fails to take necessary actions prior to the accident. Therefore assisting system which will monitor the behavior of driver and also will give the necessary alerts to the driver to prevent from the road accidents.

Keywords –Drowsiness, eye aspect ratio, alertness

I. INTRODUCTION

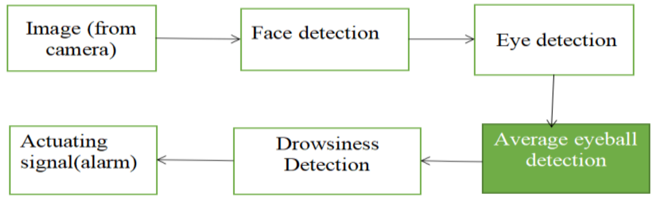
Drowsy driving is one of the major causes of deaths occurring in road accidents. The truck drivers who drive for continuous long hours (especially at night), bus drivers of long distance route or overnight buses are more susceptible to this problem. Driver drowsiness is an overcast nightmare to passengers in every country. Every year, a large number of injuries and deaths occur due to fatigue related road accidents. Hence, Adaptive drowsiness detection using machine learning is to detect the fatigue and its indication is an active area of research due to its immense practical applicability. Here, the video of the driver's frontal face is captured in acquisition system and transferred to the processing block where it is processed online to detect drowsiness. If drowsiness is detected, a warning or alarm is sent to the driver from the warning system. Hence,webcam system is proposed to detect driver's fatigue from the face image and eye movements using Python and machine learning techniques to make the system low-cost as well as portable.

II. PROPOSED ALGORITHM

This system aims to improve accuracy of detecting the drowsiness of the drivers using the features like face and eye movements . Using Support Vector Machine (SVM) Algorithm, it will classify drowsiness and undrowsiness. The proposed method is to capture eye's size of each person(driver), then compute the average of Eye Aspect Ratio and Fixed threshold using Support Vector Machine (SVM).

2.1 Block Diagram

The block diagram of drowsiness detection using SVM algorithm is to detect the image from the frame and detect the face. Using morphological process it will detect the the physical presence of image. This then it will enter into the proposed methodology for detecting the average eyeball detection . By taking eye size and eye aspect ratio (EAR) the average eye aspect ratio has to be fixed using threshold value. If the threshold level is beyond or below the threshold level it will detect drowsiness and start actuating alarm signal.



2.1 Block Diagram

2.2 Eye Aspect Ratio

It is to calculate the temporal consistency and speed of left and right eye blinks.Each eye is represented using 6 landmarks points.

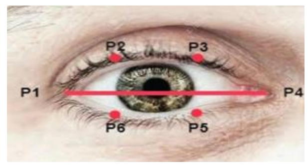


Fig 2.2 Eye Aspect Ratio(EAR

2.3 Calculation Of Eye Aspect Ratio

The EAR for a single eye is calculated using this formula:

$$\mathbf{EAR} = \frac{\|P2-P6\|+\|P3-P5\|}{2\|P1-P4\|}$$

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

Fig 2.3 Eye Aspect Ratio Calculation

2.4 Eye blink rate

If a person is feeling fatigued or drowsy, his/her eye blinking pattern changes. Using the detected eyes, the eye-blink rate varied from the average threshold level. It determines that the person is fatigued or low on attention. Between the starts and end points of a blink,it corresponds to time difference and measures in seconds.

Fig 2.4 Eye Blink Rate

III. Experiment and Result

3.1 Time Processing For Eye Detection

Person 1

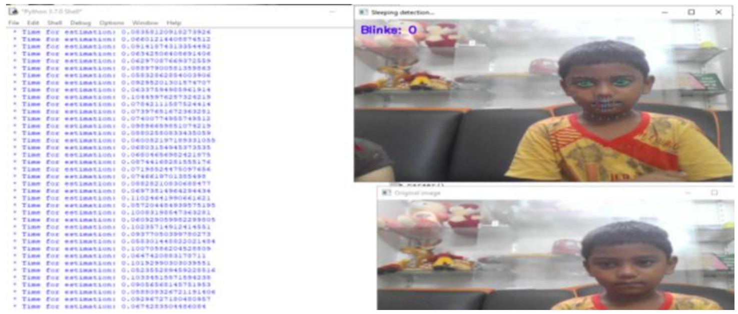


Fig 3.1.1 Person 1 blink 0 at t sec

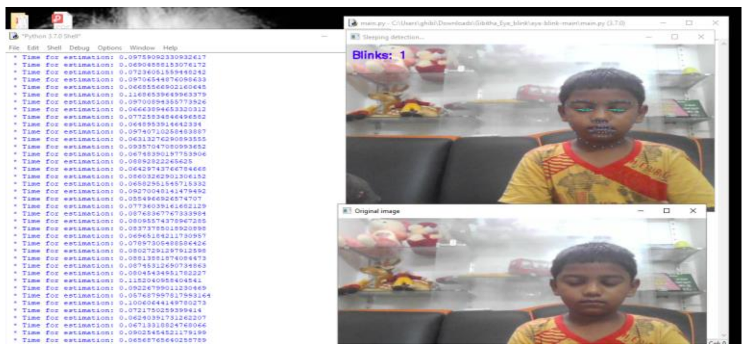


Fig 3.1.2 Person 1 blink 1 at t+1 sec

Person 2

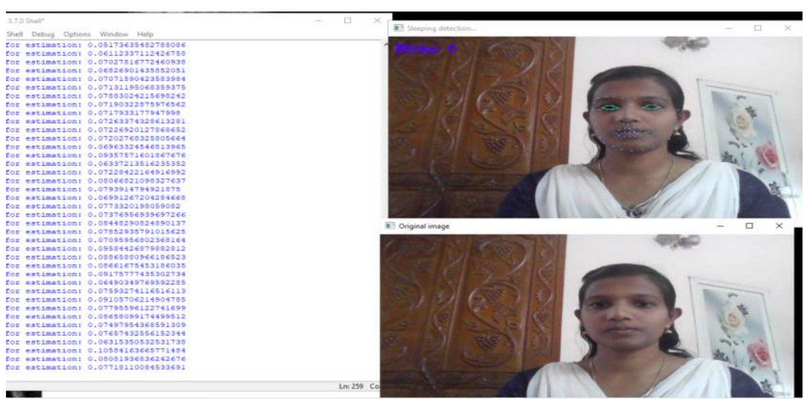


Fig 3.1.3 Person 2 blink 0 at t sec

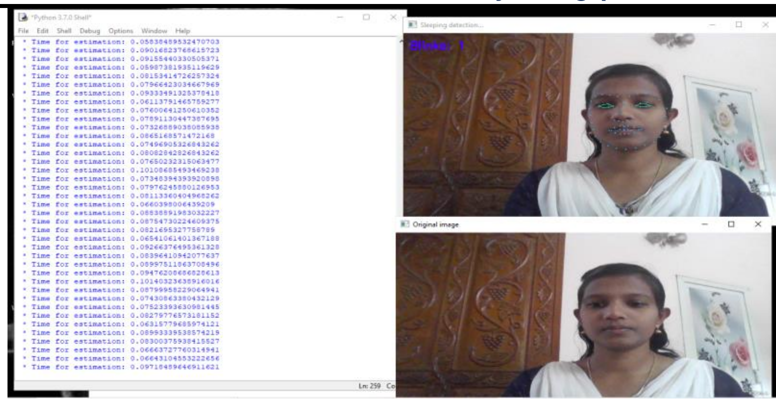


Fig 3.1.4 Person 2 blink 1 t+1 sec

Person 3

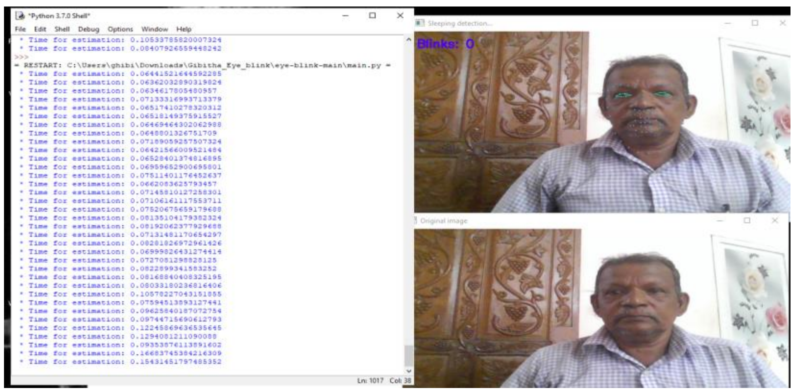


Fig 3.1.5 Person 3 blink 0 at t sec

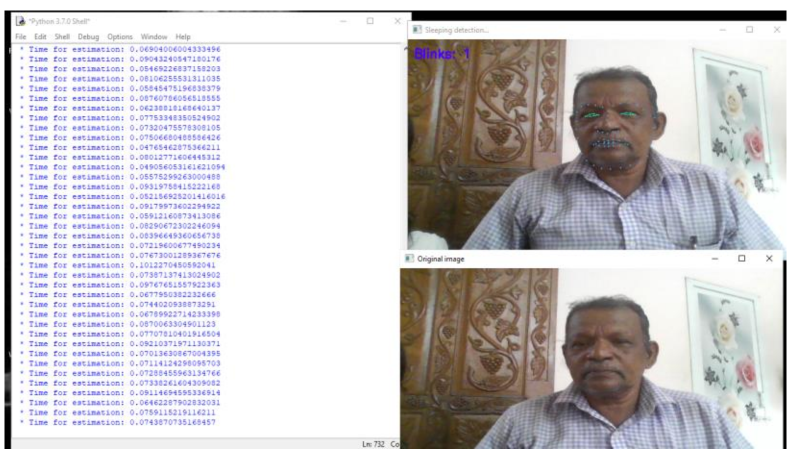


Fig 3.1.6 Person 3 blink 1 at t+1 sec

Person 4

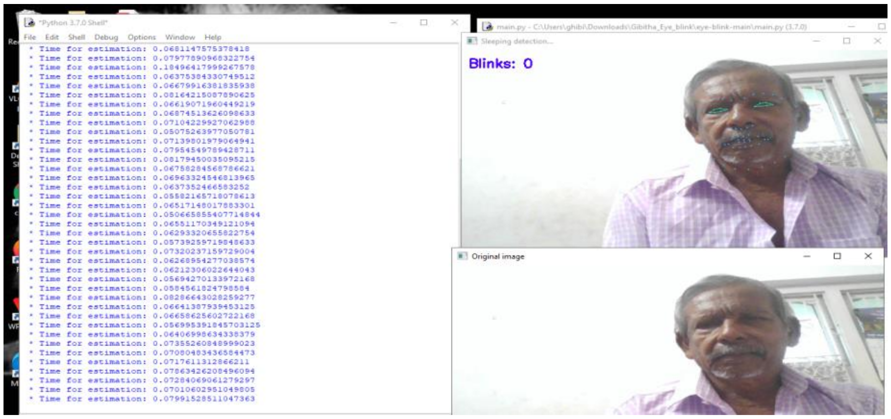


Fig 3.1.7 Person 4 blink 0 at t sec

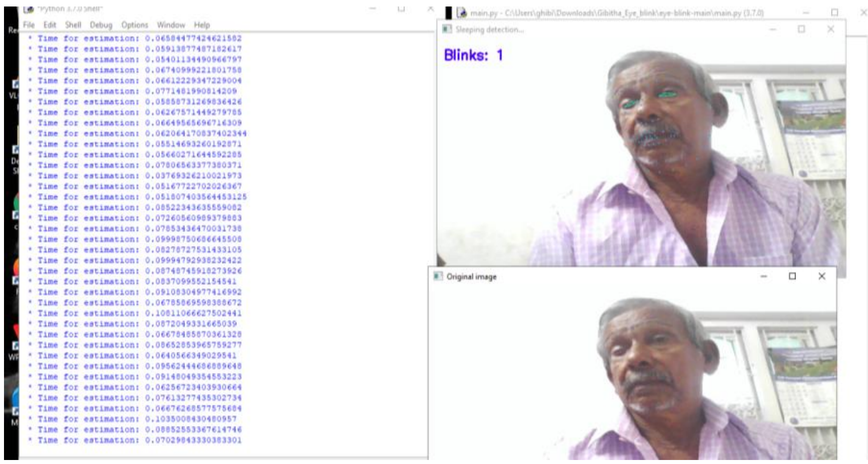


Fig 3.1.8 Person 4 blink 1 at t+1 sec

3.2 Comparison Table For Eye Detection

PERSON	BLINK 0 AT t SEC	BLINK 1 AT t_{+1} SEC
1	0.1102	0.1014
2	0.1058	0.1168
3	0.1668	0.101
4	0.184	0.1081

Table-1 Experiment Result for eye detection

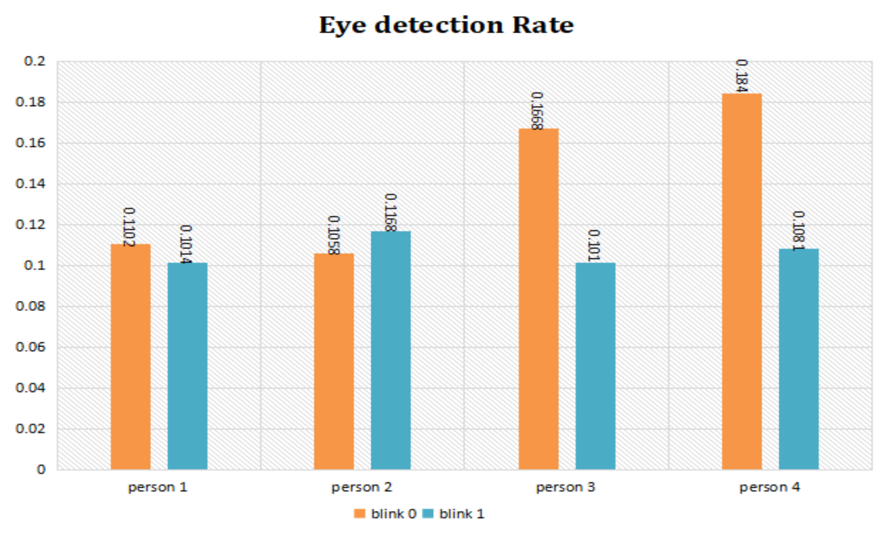


Fig 3.2 Comparison chart for max eye detection rate for different person in terms of blink 0 at t and blink 1 at t+1

IV.CONCLUSION

Real time driver drowsiness monitoring system is based on visual behavior and machine learning. Visual behavior features like face, eye movements,eye aspect ratio are computed from the streaming video, captured by a webcam. An adaptive threshold technique has been developed to detect driver drowsiness in real time. With the generated synthetic data, the developed system works accurately. By the use of support vector machine (SVM) algorithm, it gives better accuracy with faster prediction, and the best for multivariate numeric data. This help to develop a more accurate drowsiness detecting system for drivers, and it also reduce accidents. This work can be extendedby calculating the average of eye aspect ratio(EAR) and fixed the level of threshold using Support Vector Machine(SVM) algorithm.

REFERENCES

[1] Burcu Kır Savas, Yaşar Becerikli, "Real Time Driver Fatigue Detection Based on SVM Algorithm", IEEE International Students' Conference on Electrical, Electronics and Computer Science, 2020.
[2] Minho Choi, Sang Woo, "Online SVM-Based Personalizing Method for the Drowsiness Detection of Drivers", IEEE Sensors Journal , Volume: 20, Issue: 7, April 2020 .
[3] Jongmin Yu , Sangwoo, "Drivers Drowsiness Detection using Condition-Adaptive Representation Learning Framework", IEEE journal 2020 , Vol 14 August 2019.
[4] Jagadamba M , Raksheetha H R, "Driver Drowsiness Detection System in Automotive Vehicles", International Journal of Engineering Research & Technology, 2020.
[5] luis dario, sinche cueva, "Advanced Driver Assistance System for the drowsiness detection using facial landmarks", Conference on Information Systems and Technolies (CISTI), 2020.
[6] Xin qin, Yigiang chen, "DrowsyDet: A Mobile Application for Real-time Driver Drowsiness Detection", IEEE conference smart world, 2019.
[7] Marwa K Hussein, Abbas, "Driver Drowsiness Detection Techniques: A Survey", 1st Babylon International Conference on Information Technology and Science (BICITS), 2021.
[8]ciro natalae, Fioccola, " Evaluation of Driver Drowsiness based on Real-Time Face *Analysis",* IEEE International Conference on Systems, Man, and Cybernetics (SMC), 2020.
[9] N.Vasudevan, V. Nagarajan, "Driver Drowsiness Detection using Percentage Eye Closure Method",International Conference on Communication and Signal Processing (ICCSP), 2020.
[10] Narcis-lalien, ciprian-marius, "Drivers' Drowsiness Detection and Warning Systems for Critical Infrastructures",International Conference on e-Health and Bioengineering (EHB), 2020.