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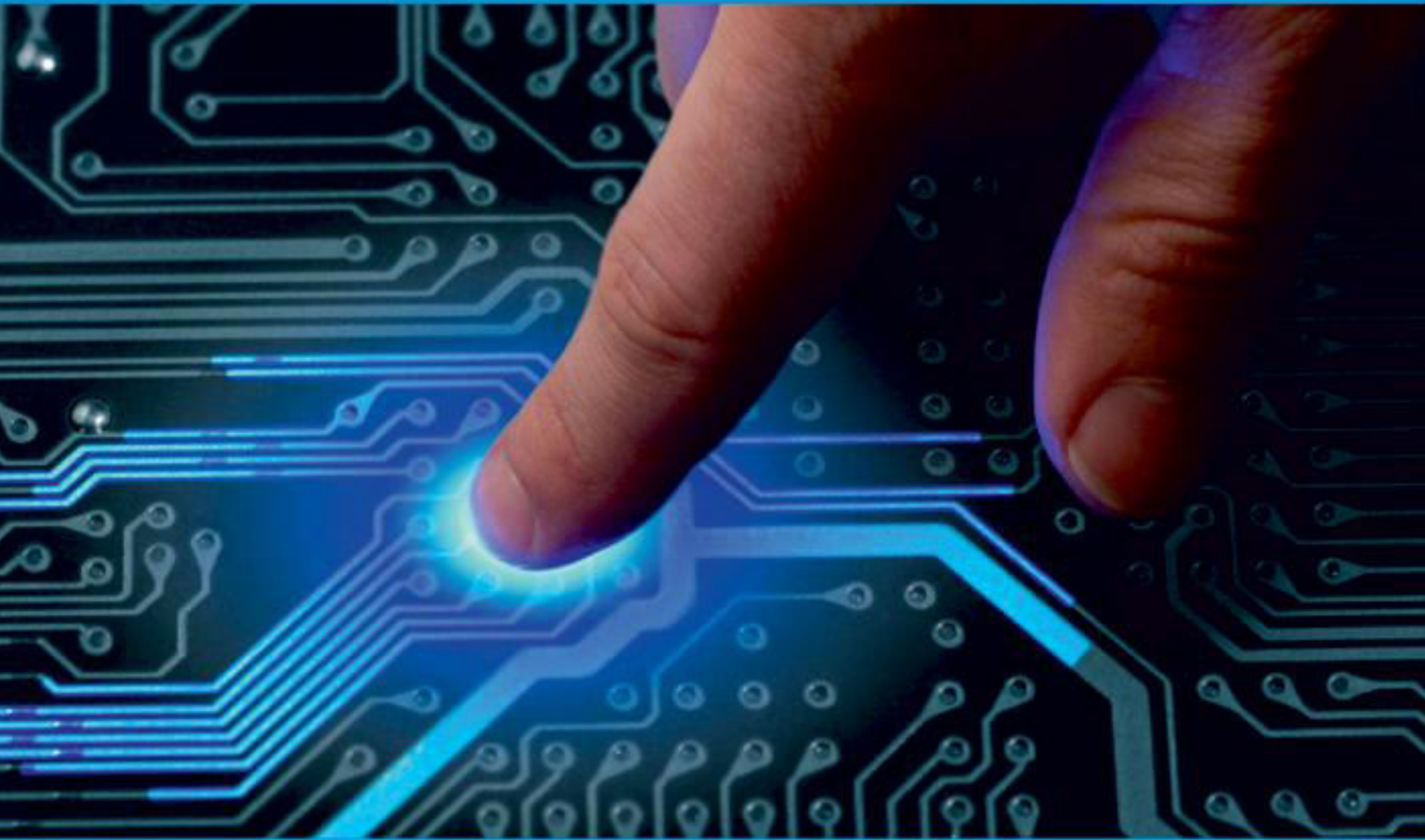

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Eye Monitoring System for Drowsiness Identification Using Image Processing

Devi Priya S[1], Dhanukeerthi S[2], Gayathiri Sri S[3], Arockiaabins[4]

Student, Dept. of C.S.E, Velammal Engineering College, Chennai, Tamil Nadu, India [1,2,3]

Assistant Professor, Dept. of C.S.E, Velammal Engineering College, Chennai, Tamil Nadu, India[4]

ABSTRACT: A person when he or she doesn't have a proper rest especially a driver, tends to fall asleep causing a traffic accident. An important application of machine vision and image processing could be driver drowsiness detection system because of high importance in life saving structure. In recent years there have been many research projects reported in the literature based on this field. The present work wants to understand a system that can notices the drowsiness of the driver, in order to decrease traffic accidents. For that system, it will take the processing of images through a camera which will focus the driver. In that, it is going to analyze the changes that happen in the driver's face and then will be processed through a program in order to notices drowsiness to send an alert to the driver. Based on the alert given by the system the driver as well as the co-passengers gets an awareness about the state of the driver. This may reduce the risk of the vehicle dashing into the vehicles on the road.

KEYWORDS: SciPy spatial algorithm, Image processing technique, EAR and MAR calculation

I. INTRODUCTION

In computer science, digital image processing is the significance of a digital computer to process digital images through an algorithm. The identification of eye movements probably starts with image processing techniques such as eye detection, mouth detection followed by (low-level) feature extraction to detect landmarks of the eye regions and possibly areas with certain textures. This processing technique is to monitor the eye and mouth gestures of the driver.

II. LITERATURE SURVEY

A. Four methods to detect drowsiness:

Sensing of physiological characteristics, sensing of driver operation, sensing of vehicle response, monitoring the response of driver out of this, the first two methods are accurate but expensive and need many sensors like brainwave sensor which cannot be used. Whereas, methods like monitoring vehicle motion and driver responses is a good method and implementable. Authors Mrs.S. Dhanalakshmi, J.Jasmine Rosepet, G.Leema Rosy, M.Philominal said in their paper that machine is an essential part to detect the face and localize the eyes, but it is more important to train the machine efficiently to work effectively to detect the eyes and drowsiness. On-intrusive machine visionbased drowsy driver detection system in which images are used to detect eye position and eye blink frequency to calculate drowsiness detection can work perfectly and can save the lives of many people. Various papers show that using SVM can make the system robust but increases complexity of the system

B. Visual Analysis of Eye State and Head Pose for Driver Alertness Monitoring:

In 2013, G. Kong et. al. described 'Visual Analysis of Eye State and Head Pose for Driver Alert Monitoring System'. They presented a visual analysis for eye state and head position(HP) for continuous monitoring of alertness to the vehicle driver. Most interesting approaches to visual detection of non-alert driving systems rely either on eye closure or head nodding angles to determine the driver drowsiness or distraction level. The proposed scheme gives a significance of visual features such as eye index (EI), pupil activity (PA), and HP to extract critical information on non-alertness of a vehicle driver. A support vector machine (SVM) classifies a sequence of video parts into alert and non-alert driving events. Experimental results show that the proposed scheme gives a high classification accuracy with acceptably low errors and false alarms for people of various ethnicity and gender in real road driving conditions.

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III.SYSTEM STUDY

A. *Image processing technique:*

Image processing is a method to perform some operations on an image, in order to get an enhanced image or to extract some useful information from it. It is a type of signal processing in which input is an image and output may be image or characteristics/features associated with that image. Nowadays, image processing is among rapidly growing technologies. It forms core research area within engineering and computer science disciplines too. Image processing basically includes the following three steps:

- Importing the image via image acquisition tools;
- Analyzing and manipulating the image;
- Output in which result can be altered image or report that is based on imageanalysis.

There are two types of methods used for image processing namely, analogue and digital image processing. Analogue image processing can be used for the hard copies like printouts and photographs. Image analysts use various fundamentals of interpretation while using these visual techniques. Digital image processing techniques help in manipulation of the digital images by using computers. The three general phases that all types of data have to undergo while using digital technique are pre-processing, enhancement, and display, information extraction.

B. *Face Recognition and Face Detection:*

Face recognition is a technique of recognizing faces but it is not necessary to "freeze" the user in order to take a picture. Though there is a problem with recognizing faces when the pose of the face is different, but in particular, there is a limit on face rotations in depth, which include left and right and up and down rotations. Face recognition itself is difficult because it is a fine discrimination task among similar objects. Adding pose variation naturally makes the problem more difficult. This is because the appearance of a person's face changes under rotation since the face has a complex 3D structure.

A distinguish have to be made between face recognition and face detection. Many people things that these two terms are the same. Though face recognition and face detection have many similar techniques, based on the same idea and algorithms, they differ from each other. The main difference is the fact that, face recognition is detecting faces and search through a dataset in order to find an exact match. Face recognition is computationally and psychophysically more appropriate to consider them as a set of co-operative visual modules with closed-loop feedback. In order to realize such a system, an integrated approach has been adopted which will perform acquisition, normalization and recognition in a coherent way. Images of a dynamic scene are processed in real-time to acquire normalize and aligned face sequences. In essence, this process is a closed-loop module that includes the computation and fusion of three different Visual cues: motion, color and face appearance models.

In general, much research effort has been concentrated on face recognition tasks in which only a single image or at most a few images of each person are available. A major concern has been scalability to large databases containing thousands of images. However, large intra-subject variability casts doubt upon the possibility of scaling face recognition, at least in this form, to very large.

The tasks of face recognition mostly require recognition to be performed using sequences acquired and normalize automatically in poorly constrained dynamic scenes. These are characterized by low resolution, large-scale changes, variable illumination and occasionally inaccurate cropping and alignment. Recognition based upon isolated images of this kind is highly inconsistent and unreliable. However, accumulating recognition scores over time can compensate the poor quality of the data.Face recognition is an active research area involving different fields such as physics, psychology, biology, mathematics, computer science and several others. A wide range of problems has been approached, resulting in many interesting applications.

IV. DESIGN AND IMPLEMENTATION

Drowsiness Detection is achieved by, dlib’s Frontal Face detector, dlib’s Landmark Predictor. First step to detect a face using dlib's frontal face detector. Once the face is detected, next step to detect the facial landmarks in the face using the dlib's landmark predictor. The landmark predictor returns 68 (x, y) coordinates representing different regions and coordinates in the face, namely - mouth, left eyebrow, right eyebrow, right eye, left eye, nose and jaw.

The process involved in Drowsiness Detection as follows,

A. Face Detection
B. Dlib’s Facial Landmark
C. EAR and MAR Calculation

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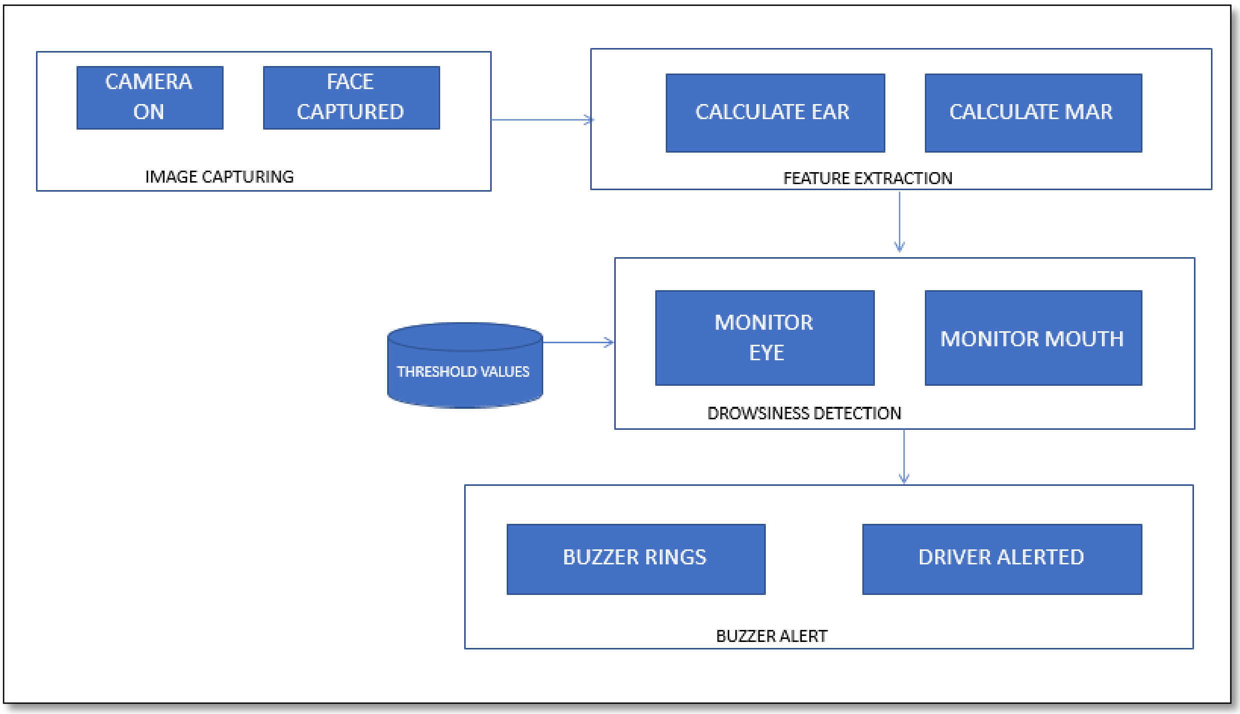

Fig.1.Architecture Diagram

V. MODULES

A. Image Capturing:

In this module camera is used to capture the image of the driver's face by switching on the system. Once the face is detected, we try to detect the facial landmarks in the face utilize the dlib's landmark predictor. This technique depends on distribution of intensity gradients or the edge directions for detection features.

B. Feature Extraction:

The landmark predictor returns (x, y) coordinates representing different regions of the face such as mouth, left eyebrow, right eyebrow, right eye, left eye, nose and jaw. Of course, we don't need all the landmarks, here we need to extract only the eye and the mouth region. We use SciPy spatial algorithm for extracting the features of the user by using Euclidean formula. Eye aspect ratio can be calculated using Equation,

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

eq. (1). EAR

where, p1, p2, ..., p6 are 6 eye landmarks. Similarly mouth aspect ratio (MAR) can be calculate using,

$$MAR = \frac{\| q_2 - q_8 \| + \| q_4 - q_6 \|}{2 \times \| q_1 - q_5 \|}$$

eq. (2). MAR

where, q1, q2, ..., q8 are 8 mouth landmarks.

C. Drowsiness Detection:

Drowsiness is then detected by computing the aspect ratios of eye frames and mouth based on their facial landmarks.The threshold (θ) for eye is 0.15 such that if eye aspect ratio (EAR) is less than 0.15. The Threshold (θ1) for mouth is 0.1 if Mouth aspect ratio (MAR) is greater than 0.1 over a specified period of time frames then drowsiness alert must be triggered using buzzer alert.

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$$\text{Eyeclosed} = \begin{cases} True & \text{if } EAR \leq \theta \\ False, & \text{otherwise.} \end{cases}$$

$$\text{Yawn} = \begin{cases} True & \text{if } MAR \geq \theta_1 \\ False, & \text{otherwise.} \end{cases}$$

eq. (3). Eyeclosed & Yawn

D. Buzzer Alert:

Continuous threshold for eyes closed is consecutive eye (CE) and yawning is consecutive mouth (CM) are 50 and 90 respectively. Threshold initialization depends on the distance of the camera from the driver used to take the feed. These thresholds are adjustable for a particular distance and if distance is changed, thresholds will also need to be changed.

$$CM = 90 - 2.72 \times (TIME)/3600$$

$$CE = 50 - 1.81 \times (TIME)/3600$$

eq. (3). CM & CE

Consecutive eye values and consecutive mouth values can be calculated using Equation, where, 2.72 and 1.81 is a slope value of linear equation. TIME = 9×60×60 = 32400, since decrement of threshold start after 3 hours, thus we take 9 hours for time and converted 9 hours in seconds. As the driving time of a driver increases threshold for continuous time frames of eyes and mouth are starts decreasing by the Equation. So, the system with time increases becomes more sensitive to detect drowsiness and triggered alarm. An average yawning time for a healthy person is to be 4 to 6 seconds.

VI. CONCLUSION

The Eye Monitoring System for Drowsiness Identification Using Image Processing is for detecting drowsiness of the driver by developing web application. The system which can differentiate normal eye blink patterns using dlib libraries and SciPy spatial algorithm for calculating facial landmarks. During the monitoring, the system is able to decide if the eyes are opened or closed based on eye boundaries. When the eyes have been closed for about three seconds, the buzzer beeps to alert the driver. By doing this many accidents will be reduced and provides safe life to the driver and vehicle safety. Using this drowsiness detection system, driver safety can be implemented in normal cars also. The most common reason for the accidents we found was the drivers fatigue or lack of concentration. There are various ways in which we can keep an eye on the driver and alert him/her in case they are drowsy. To reduce or to minimize the number of road accidents happening we need to detect the drivers' drowsiness and alert him. This project's main objective is to build a web application system for detecting driver drowsiness. In this detection system we used a Opencv to detect the face of the driver and by using facial landmarks. A system which aims to improve the safety and comfort of the car/vehicle by warning the person driving when he feels sleepy. It is an approach towards identifying the drowsiness of the driver and gives alert to the driver while feeling drowsy for minimizing the accidents.

VII. FUTURE WORK

The future works may point on the utilization of outer factors such as vehicle states, sleeping hours, weather conditions, mechanical data, etc., for fatigue measurement. Driver drowsiness position a major threat to highway safety, and the problem is particularly severe for commercial motor vehicle operators. Twenty-four hour operations, high annual mileage, exposure to challenging environmental conditions, and demanding work schedules all contribute to this serious safety issue. Monitoring the driver's state of drowsiness, vigilance and providing feedback on their condition, so they can easily take appropriate action is one crucial step in a series of preventive measures necessary to

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address this problem. At present time, there is not adjustment in zoom or direction of the camera during operation. In future work may be to automatically zoom in on the eyes once they are localized.

REFERENCES

1. Anushka Shelke#1,Kritika Sharma*2,Mayur Raskar#3,Vishal Pati#4,Dr.S.P.Godse#5 Computer Engineering Department,Sinhgad Academy Of Engineering,Savitribai Phule Pune University"Driver Drowsiness Detection Using Image Processing" 2020 .
2. J. F. Antin (2011). Design of the in-vehicle driving behavior and crash risk study: In support of the SHRP 2 naturalistic driving study. U.S. Transportation Res. Board. Washington, D.C. Rep. S2-S05-RR-1.
3. J. H. L. Hansen, K. Takeda, S. M. Naik, M. M. Trivedi, G. U. Schmidt, and Y. J. Chen, "Signal processing for smart vehicle technologies," IEEE Signal Process. Mag., vol. 33, no. 6, pp. 12–13, Nov. 2016.
4. Miyajima and K. Takeda, "Driver-behavior modeling using on-road driving data: a new application for behavior signal processing," IEEE Signal Process. Mag., vol. 33, no. 6, pp. 14–21, Nov. 2016.
5. Y. Choi, S. I. Han, S.-H. Kong, and H. Ko, "Driver status monitoring systems for smart vehicles using physiological sensors," IEEE Signal Process. Mag., vol. 33, no. 6, pp. 22–34, Nov. 2016.
6. S. Aghaei, B. Donmez, C. C. Liu, D. He, G. Liu, K. N. Plataniotis, H. -Y. W. Chen, and Z. Sojoudi, "Smart driver monitoring: When signal processing meets human factors," IEEE Signal Process. Mag., vol. 33, no. 6, pp. 35–48, Nov. 2016.
7. Kaur, N., Verma, S., Kavita, & Yadav, A. L. (2019). Survey on classification and clustering schemes in big data using image processing. International Journal of Control and Automation, 12(4), 170-188. 48
8. "2018 Honda Accord Press Kit- Safety and Driver Assistive". Owners.honda.com. Retrieved 2018-03-23.
9. "Driver Attention Monitor | 2017 Honda CR-V | Honda Owners Site". Owners.honda.com. Retrieved 2018-03-23.
10. Zirmite, R., & Vaidya, R. (2019). The study of gesture recognition by using gesture algorithm.