

Review Paper on: Wakefulness Detection System

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Abstract—This paper present a new approach to automotive safety. We see him propose three different nut closely related concept. An image processing system, a drowsy drive detection system, and a distress signal system using a nonintrusive computer vision-based concept. Recently, the number of accidents due to fatigue has increased significantly. This prototype is a real-time system that continuously captures images according to a specified algorithm, measures eye conditions, and alerts if necessary. To minimize these issues, we've incorporated facial recognition image processing to help with authentication, as well as improved sleep detection and driver warning systems.

A value per closed eye is calculated to detect drowsiness. Therefore, if the eye closure time exceeds a certain value, the driver is perceived as drowsy or in the state of sleep.

Index Terms— Sleep Detection, Face Detection, Driver fatigue, Driver monitoring system.

I. INTRODUCTION

A driver's level is reduced by sleep deprivation, long periods of continuous driving or other medical condition such as brain damage. Some traffic accident studies say that about 40% of accidents are caused by driver fatigue. When a human drives longer than normal. For humans, it causes excessive fatigue and also this drives the driver into a drowsy state or unconsciousness. Drowsiness is a complex phenomenon that indicates impaired driver attention and awareness. There is no direct method to detect drowsiness, but several indirect methods can be used for this purpose. The consequences of drowsy driving are extremely dangerous and can lead to death, injury and vehicle damage. As is the most important safety factor, serious measures should be taken to improve working conditions for drivers to minimize the negative effects of drowsy driving. Computer science and engineering play a responsible role in the development and improvement of society by providing valuable services in different fields related to different aspects of life. Various types of methods for measuring driver sleepiness have been mentioned, including vehicle measurements, physiological measurements, and behavioral measurements. These methods can be used to develop intelligence systems that warn drivers in case of drowsiness and prevent accidents. The most accurate method is selected and suggested according to its strengths and weaknesses. Next, operation of the overall system development will be described. Then every frame is analyzed and faces are detected first. Once the face is detected, the next task is to locate the eyes. After a positive result of eye detection, the amount of eye closure is calculated and compared to her baseline value of sleepy eyes.

II. RESEARCH MOTIVATION

We have decided this topic for the project to work with our team have come across various innovative topics that

will help people to solve their real life problems, but we wanted to work on this project that will impact on social too, we have heard many accidents taking place because of the driver's drowsiness condition, which is resulting into loss of life as well as property, therefore after mutual decision we finally decided the topic that will not only solve peoples real life problem but also help them to save their and their family's life and drive them safe back to their destination. Therefore we have created Driver's Sleep Detection System.[1]

Related work:

Several efforts to develop non-intrusive visual-based drowsiness monitoring systems have been reported in the literature. Develop a system that does not respond to light. We used the Haar algorithm to detect objects and used a face classifier implemented in the OpenCV library. [2] These part are derived from facial regions using maximum factor. It then recognizes the eyelids and measures the degree of eye closed. Implement a system to detect driver drowsiness symptoms based on an infrared camera. Using the bright pupil phenomenon, we have developed an algorithm to detect and track the driver's eyes. Alerts the driver with a warning message when drowsiness is detected thresholding to extract face regions. Eye locations are identified by finding facial features such as eyebrows and the center of the face. Morphological operations K-Means is used for correct eye fragmentation. set of shape and features is then computed and learned using a nonlinear SVM to obtain a eye states. Define a system that detects driver fatigue by detecting eye conditions in real time. Face region recognition is based on the optimized method of Jones and Viola [2]. The eye region is obtained by horizontal rotation. Finally, a dynamic new complexity function threshold for identifying eye diseases. System construction is to check the movement of the driver's eyes. our system uses Cb and Cr elements of the YCbCr colour area. The system detects faces in vertical projection and eyes in horizontal projection. one time eye position is determined, the system uses the complexity function to calculate the eye state.[3] Considering the above, driver drowsiness detection provided by PERCLOS generally goes through the following phases:

- 1) face Scanning,
- 2) eye position,
- 3) Eyes And Face detection
- 4) Scanning of Eye State
- 5) Calculation of blinking and Identification of Driver States.

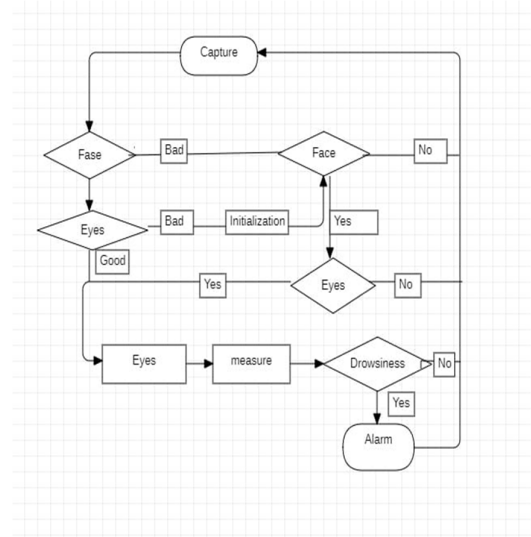


Figure 1 : Flowchart of the proposed system

III. THE PROPOSED SYSTEM

A. Face Scanning

Symmetry is one of the key features of surface. Model the symmetry of the HD image with a 1D signal. objects in the picture objects in the image. [5] The traditional principle of computing a symmetric signal is that for every

two white dots on the same space, the media value inside these two dots in the acc vector is incremented. (This algorithm is applied to edge images, called white pixels (pixels with a value of 1)). enhances the image
 It improves the image symmetry calculation algorithm and applies a set of rules to adapt it to face detection so that it can better calculate face symmetry. Instead of computing the symmetry between the two white points in the image, compute the symmetry between the two foils.

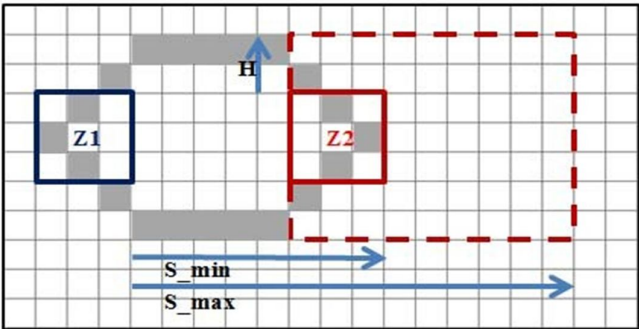


Figure 2 - A new method to improve image symmetry calculations

For each window Z1, scan window Z2 in the region determined by the parameters S_min, S_max, and H. If the sum of white pixels is between the two thresholds S1 (maximum) and S2 (minimum), increase the symmetrical signal between these two windows [6]. Then the vertical region of the image contour (region of interest). ROI), corresponding to the maximum index of the acquired balanced signal. Then take a rectangle camera was fixed and the driver do motion in a limited area, after the camera calibration procedure the face size from the focal length of the camera is can be estimated), then scan the ROI by finding: [7] Region containing maximum energy corresponding to

$$\begin{aligned}
 \text{Eye State} &= \text{open} && \text{if } S \leq TH \\
 &= \text{Closed} && \text{if } S = TH
 \end{aligned}$$

Face

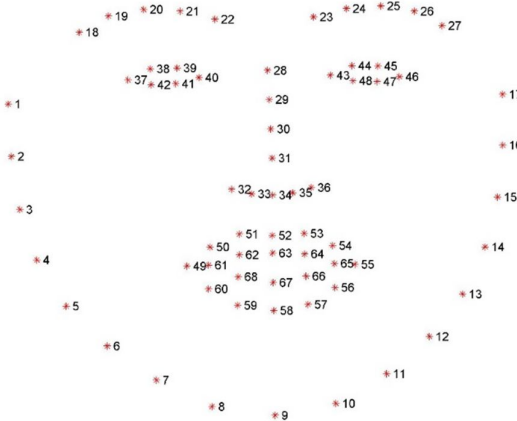


Fig.face co-ordination

2).Eye Localization:

because the eye is always defined region of We limited our investigation of the face (anthropometric features of the face) to Region between forehead and mouth (eye region of interest, 'eROI'). use your eyes symmetry to recognize them in faces. First, symmetry is calculated by passing her eROI vertically through a rectangular mask of width equal to the estimated eye height and face width.

The eyes correspond to highly symmetrical positions. Then compute the symmetry once in this conserved region again on both the left as well as right sides.[8] The pic value releted to the mid of eye

Eye State:

a determination of the eye state is divided into two states, whether the eyes are open or closed. To recognize the iris, we use the circular Hough transform [10] (HTC) on the eye image. To do this, Apply HTC to eye edge image to detect and get circles with defined rays circle with Highest value of Hough accumulators for all rays. Next, we apply a logical 'AND' logic by measuring the intersection point 'S' between the edge image and the full circle obtained from the HTC. lastlly, the "State Eye" is defined by testing the value "S" using a threshold.

How algorithm Works:

system is start with an very initial phase, eye and face detection, extracting face and eye regions and using them as templates for tracking in the next frame. Track by track, test whether the track is not good or good. If the tracking is insufficient, go back to the initial phase. If not, proceed to the next step. namely, eye state identification and driver state.

IV. LITERATURE SURVEY

Driver Drowsiness Detection System and Techniques Driver Drowsiness.

Detection Device and Strategies Experts have observed that drivers tend to get sleepy when they stop taking breaks.

Observations suggest that accidents occur because drowsy drivers seek rest, which is why traffic accidents are more likely because of sleepiness than drunk driving. Attention Aid can warn of inattentiveness or sleepiness at high speeds and inform drivers in today's countries of fatigue and driving time. This is to close damage, provide adjustable sensitivity and, if alerted, suggest nearby service areas in COMAND navigation. device.

V. IMPLEMENTATION OF SLEEPINESS SCANNING

This article explains how to make Cars smarter and more interactive. Car can report or resist a person in an unacceptable situation. It can provide vital statistics of the real-time situation to save the car, help the police or the owner himself. Driver fatigue due to sleep disturbance is a major problem with increasing accidents on today's roads. on this paper, we describe a actual-time protection prototype that controls the car velocity underneath driving force fatigue .[10] To enhance a machine to locate fatigue signs and symptoms in drivers and manage the pace of vehicle to keep away from injuries is the purpose of such a method. In this paper, we advise a driving force Drowsiness Detection A device that uses sensors such as the Blink Sensor to detect driver drowsiness. If the driving force is determined to be asleep, the buzzer will begin to sound and then the car ignition will be turned off

B. Determining Driver Drowsiness Based on Sensors (2) Behavioral Measures and (3) Physiological Measures A specific evaluation of these countermeasures provides insight into common systems, the issues associated with them, and the improvements needed to create a robust system. This paper evaluates his three countermeasures for his sensor in use and describes the merits of each and his failures. Various approaches to experimentally manipulate drowsiness have also been discussed, with the development of a hybrid sleepiness detections A system that combines non-invasive physiological measurements with other measurements to determine a driver's sleepiness stage. I'm here. It is concluded that it may be identifiable. You can prevent it by sending an alert to the sleepy task force.

D.Eye Recognition-Based Driver Drowsiness Monitoring and Warning Systems

This task presents a method to develop an interface to address driving force drowsiness based on continuous eye monitoring and the DIP algorithm . Microsleep is a rapid sleep duration of 2 - 3 second and is a good detector of land fatigues. As a result, by simultatanuously monitors the driver eye using a camera, it is possible to identify the driver's sleepy country and receive timely warnings. The purpose of this mission is to use controllers and photo processing to extend the hardware, a very advanced product for protecting drivers on the road.

VI. CONCLUSIONS

This paper describes the design and implementation of a visual driver drowsiness detection system intended to warn drivers when they are drowsy. OpenCV is a large open-source vision, machine learning, and image processing computer library that plays a big role in the real-time operations that are so critical in his systems today. With it you can process images and his video to identify the handwriting of an object, face or person. The challenge of face detection with Adaboost is the number of false positives associated with real faces detected against complex backgrounds. In this study, we presented a probabilistic weight-adaptive Adaboost algorithm to detect faces against a complex background that reduces false positive errors. I would like to reduce the number of regions in an image that are classified as faces but are not faces. Adaboost's main drawback is that it requires a high-quality dataset. Noisy data and outliers should be avoided before adopting the Adaboost algorithm. The Driver Drowsiness System can quickly identify sleepy driving behavior.[9] The drowsiness detection system that closes the driver's eyes developed based on the OpenCv algorithm can distinguish between normal blinking and drowsiness and detect drowsiness while driving. The proposed technology can prevent accidents caused by drowsy drivers. Several image processing methods are used to collect information about head and eye position. Surveillance systems can determine if the eye is open or closed. If you keep your eye closed for a long time, you will get a warning signal. This process assesses the driver's level of attention based on consecutive eye closures. The OpenCV method is a popular method for face recognition.

REFERENCES

- [1] Ayman Altameem, Ankit Kumar, Ramesh Chandra Poonia. Early Identification and Detection of Driver Drowsiness by Hybrid Machine Learning IEEE Xplore 2021,doi: <https://ieeexplore.ieee.org/stamp/stamp.jsp?tp=&arnumber=9628122>
- [2] Radhika N. Gandhi, Parth R. Ambhorkar, Ayush A. Datir Driver Drowsiness Detection System using Embedded System International Journal Of Computer Science and Information Technology Research 2022 doi: <https://zenodo.org/record/6573055#.Y1DoODNX5Pw>
- [3] F. Guede-Fernández, M. Fernández-Chimeno, J. Ramos-Castro, and M. A. García-González, "Driver drowsiness detection based on respiratory signal analysis," IEEE Access, vol. 7, pp. 81826–81838, 2019, doi: 10.1109/ACCESS.2019.2924481.
- [4] Y. Saito, M. Itoh, and T. Inagaki, "Driver assistance system with a dual control scheme: Effectiveness of identifying driver drowsiness and preventing lane departure accidents," IEEE Trans. Human-Mach. Syst., vol. 46, no. 5, pp. 660–671, Oct. 2016, doi: 10.1109/THMS.2016.2549032.
- [5] J. Yu, S. Park, S. Lee, and M. Jeon, "Driver drowsiness detection using condition-adaptive representation learning framework," IEEE Trans. Intell. Transp. Syst., vol. 20, no. 11, pp. 4206–4218, Nov. 2019, doi: 10.1109/TITS.2018.2883823.
- [6] Y. Hu, M. Lu, C. Xie, and X. Lu, "Driver drowsiness recognition via 3D conditional GAN and two-level attention Bi-LSTM," IEEE Trans. Circuits Syst. Video Technol., vol. 30, no. 12, pp. 4755–4768, Dec. 2020, doi: 10.1109/TCSVT.2019.2958188.
- [7] G. Li and W.-Y. Chung, "Combined EEG-gyroscope-tDCS brain machine interface system for early management of driver drowsiness," IEEE Trans. Human-Mach. Syst., vol. 48, no. 1, pp. 50–62, Feb. 2018, doi: 10.1109/THMS.2017.2759808.
- [8] G. Li, B.-L. Lee, and W.-Y. Chung, "Smartwatch-based wearable EEG system for driver drowsiness detection," IEEE Sensors J., vol. 15, no. 12, pp. 7169–7180, Dec. 2015, doi: 10.1109/JSEN.2015.2473679.
- [9] M. Sunagawa, S.-I. Shikii, W. Nakai, M. Mochizuki, K. Kusakame, and H. Kitajima, "Comprehensive drowsiness level detection model combining multimodal information," IEEE Sensors J., vol. 20, no. 7, pp. 3709–3717, 2020, doi: 10.1109/JSEN.2019.2960158.
- [10] A. Dasgupta, D. Rahman, and A. Routray, "A smartphone-based drowsiness detection and warning system for automotive drivers," IEEE Trans. Intell. Transp. Syst., vol. 20, no. 11, pp. 4045–4054, Nov. 2019, doi: 10.1109/TITS.2018.2879609.