ISSN 2348-1196 (print)
International Journal of Computer Science and Information Technology Research ISSN 2348-120X (online)
Vol. 10, Issue 2, pp: (73-77), Month: April - June 2022, Available at: www.researchpublish.com

Driver Drowsiness Detection System using Embedded System

[1]Radhika N. Gandhi, [2]Parth R. Ambhorkar, [3]Ayush A. Datir, [4]Pratik R. Kale, [5]Prof. Shwetambari G. Pundkar

[1,2,3,4] Department of Computer Science & Engineering, PRMIT&R, Badnera, Amravati

[5]Department of Computer Science & Engineering, PRMIT&R, Badnera, Amravati

DOI: https://doi.org/10.5281/zenodo.6573055

Published Date: 23-May-2022

Abstract: **In recent years driver fatigue is one of the major causes of road accidents in the world. A through way of measuring driver fatigue is measuring the state of the driver drowsiness. So it is very important to detect the fatigue of the driver to save life and property. This project is aimed towards developing a system of drowsiness detection system. This prototype is a real time system which captures image continuously and measures the state of the eye according to the specified algorithm and gives warning if required. Though there are several methods for measuring the fatigue but this approach is completely non-intrusive which does not affect the driver in any way, hence giving the exact condition of the driver. For detection of drowsiness the per closure value of eye is calculated. So when the closure of eye exceeds a certain value then the driver is detected to be sleepy.**

Keywords: **Driver fatigue, Fatigue detection, Driver monitoring system, Face detection.**

I. INTRODUCTION

The attention level of driver decreases because of less sleep, long continuous driving or any other medical condition like brain disorders etc. Several surveys on road accidents says that around 40 percent of accidents are caused by fatigue of the driver. When human drives for more than normal period for human then excessive fatigue is caused and also results in tiredness which drives the driver to sleepy condition or loss of consciousness [1].

Drowsiness is a complex phenomenon which states that there is degrade in alerts and conscious levels of the driver. Though there are no direct measures to detect the drowsiness but several indirect methods can be used for this purpose [2]. The consequences of a drowsy driver are very dangerous that can lead to loss of lives, casualties and vehicle damage. As the most important safety factor, it is necessary to make some serious measures, in order to improve working conditions of drivers, so that negative consequences subjected by a drowsy driver can be minimized. Computer Science and Engineering contributes their responsible role for development and betterment of society by providing their valuable services in various fields belong to different aspects of life.

Various different types of methods for measuring the drowsiness of the driver are mentioned which includes Vehicle based measures, Physiological measures, Behavioural measures [3]. Using these methods an intelligence system can be developed which would alert the driver in case of drowsy condition and prevent accidents. Depending on advantages and disadvantages the most precise method is chosen and proposed. Then the working for entire system development is explained. Then each frames are analysed to find face first. If a face is detected then the next task is to locate the eyes. After the positive result of detecting eye the amount of closure of eye is calculated and compared with the reference values for the drowsy state eye. If drowsy condition of driver is found out then driver is alarmed else repeatedly the loop of finding face and detecting drowsy condition is carried out [4].

- The main objective is to develop a prototype that is precise to detect a driver's drowsiness based on eyelid movement and is reliable to give appropriate voice alerts in real-time.

- The other objectives include designing a prototype that detects drowsiness of drivers by monitoring the eyes of the driver regularly. The system should give an alert to the driver when the driver's eyes remain closed for a few seconds. The system works even when a driver is wearing spectacles.

II. AN OVERVIEW OF EXISTING SYSTEM

Technological approaches for detecting and monitoring fatigue levels of driver fatigue continue to evolve and many are now in the development, validation testing, or early implementation stages. Previous researches have reviewed available fatigue detection and prediction technologies and methodologies [4]. One of the method includes vehicle-based technique survey path position, which monitors the vehicle's position as it identifies with path markings, to determine driver weakness, and document steering wheel movement information to determine the fatigue from low level to high level. Other technique uses EEG to monitor driver fatigue. It is quite expensive to be commercialized and needs complex noise processing. In short, these all cannot detect the outer situation of a driver and cannot adapt to each user [5]. These builds on previous studies by providing updated information on state of the art emerging fatigue detection and alertness monitoring technologies, Significant advances in video camera and computer processing technologies combined with robust, non-invasive eye detection and tracking prototypes have made it possible to characterize and monitor a driver's state of alertness in real time under all types of driving conditions [5].

III. PROPOSED SYSTEM

The most decisive technique depends on human physiological techniques. This technique is executed in two ways: measuring changes in physiological signs, for example, brain waves, heart rate, and eye flickering; and measuring physical changes, for example, sagging posture, position of the driver's head and the open/shut conditions of the eyes. In spite of the fact that this method is most accurate, it is not reasonable, since detecting electrodes would need to be put straightforward onto the driver's body, and thus be irritating and diverting to the driver. Also, long time driving would bring about sweat on the sensors, reducing their capacity to screen accurately. Hence this approach will be mostly weighing on amount of eye closure also called **(PERCLOS)** percentage of closure as it provides the most decisive information on drowsiness. It is also nonintrusive, hence does not affect the state of the driver and also the driver feels totally comfortable with this system. Also other factors like road condition does not affect this system. The case of micro sleep is also detected according the given threshold value. The development of this system includes identification and tracking of face, detection, location and tracking of the human eye, eye state detection, and driver fatigue testing. The key parts of the detection technique merge the detection and location of human eyes and driver fatigue testing. The enhanced technique for measuring the PERCLOS estimation of the driver was to calculate the proportion of the eyes being open and shut with the aggregate number of frames for a given period [7].

IV. DESIGN

The proposed system will be able to detect drowsiness given a proper real-time driving environment. The performance will depend upon the quality of the camera as used. The proposed system due to its well-designed and easy-to-use interface can be used by both day-time and night-time drivers. Users can follow up the interface step by step for their purpose. The proposed system must be available for use to the user as and when needed provided that the user's system meets the specified requirements. The proposed system must be able to recover from failure in case of the application crashing abruptly and become ready-to-use after recovery. The system of the drowsiness detection system will be implemented on the Raspberry Pi board, along with the necessary peripheral hardware, and Python3 will be used to implement the software functionality of fatigue detection. To specify our problem, we define requirements to detect driver's fatigue with a minimum sensor system.

1. The device should measure what it is intended to, operationally that is eye blink.

2. The real time behaviour of the driver should be monitored by the device.

3. The device should be consistent while measuring over the time, and it should measure the same event for all drivers.

4. The device should be able to operate accurately and reliably in both day and night time conditions.

ISSN 2348-1196 (print)
International Journal of Computer Science and Information Technology Research ISSN 2348-120X (online)
Vol. 10, Issue 2, pp: (73-77), Month: April - June 2022, Available at: www.researchpublish.com

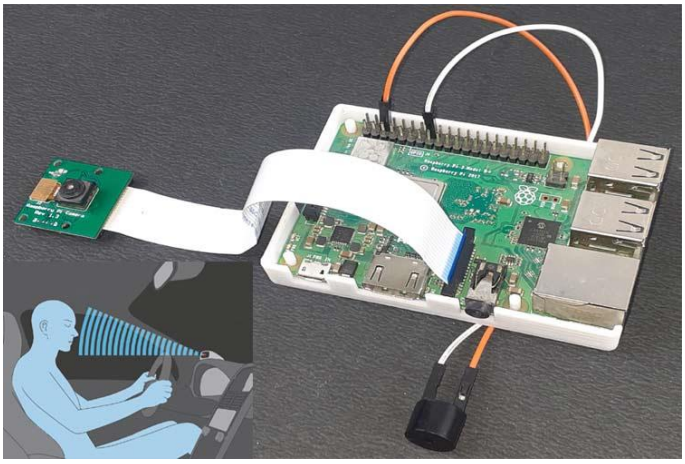

Fig 1: Proposed Fatigue detection system

5. The device should be able to operate accurately and reliably over the expected range of truck cab temperature, humidity and vibration conditions.

6. The device should be designed to maximize sensitivity and specificity

V. SYSTEM ARCHITECTURE

When the driver is driving, the driver's face is captured by a camera and it is converted into a video stream. The system then analyses the video to detect drowsiness and fatigue and also checks the level of drowsiness. In this stage, the most important parts which should be considered for analysis are: the driver's face tracking, driver's fatigue state, and recognition of key regions of the face based on eye closure. Finally, if the fatigue is detected, a warning voice alert is given.

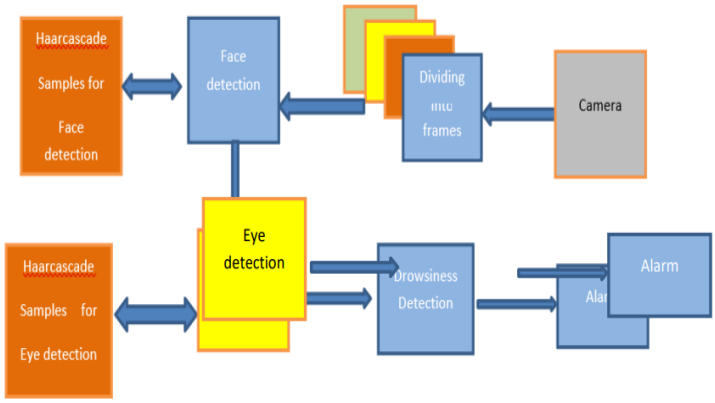

Fig 2: System architecture of Fatigue detection system

VI. COMPARISON WITH EXISTING SYSTEM

This recognition technique is better than the fingerprint, Vehicle based measures and Physiological measures because of some of the inherent disadvantages of them. Some people may not be willing about placing their fingers on the same place where many other people have continuously touched. Some people have damaged fingertips. Fingerprint recognition performance is significantly influenced by fingertip surface conditions, which may vary depending on environmental or personal causes. In vehicle based techniques the driving style of the current driver needs to be learned and modelled for the system to be efficient. The condition like micro sleep which mostly happens in straight highways cannot be detected. The physiological techniques are not reasonable, since detecting electrodes would need to be put straightforward onto the driver's body, and thus be irritating and diverting to the driver. Also, long time driving would bring about sweat on the sensors, reducing their capacity to screen accurately.

VII. CONCLUSION

This model is capable of detecting drowsiness by monitoring the eyes. Shape prediction methods are used to detect face and then eyes. The inputs given to these methods are facial landmarks which are obtained from facial landmark detection. This module deals with the EAR function which computes the ratio of distances between the horizontal and vertical eye landmarks. An speaker module is also deployed which is used for giving appropriate voice alerts when the driver is feeling drowsy. Through research presented in this paper, a new system is designed to decrease the rate of accidents and to contribute to the technology with the goal to prevent fatalities caused due to road accidents.

REFERENCES

[1] W. Zhao, R. Chellappa, P.J. Phillips, and A. Rosenfeld, "Face Recognition: A Literature Survey," ACM Computing Surveys, vol. 35, pp. 399-459, 2003.

[2] M. H. Yang, D. J. Kriegman, and N. Ahuja, "Detecting faces in images: A survey,"IEEE Trans. Pattern Anal. Mach. Intell., vol.24, no.1, , Jan. 2002, pp. 34–58.

[3] Nan-Ning Zheng,Shuming Tang,Hong Cheng and Qing Li,Guanpi Lai and Fei-Yue Wang,"Toward Intelligent Driver-Assistance and Safety Warning Systems",Intelligent Transportation System,IEEE 2004.

[4] Christian Scharfenberger, Samarjit Chakraborty, John Zelek and David Clausi", Anti-Trap Protection for an Intelligent Car Door System", 15th International IEEE Conference on Intelligent Transportation System, Anchorage, Alaska, USA, September 16-19, 2012.

[5] K. C. Yowand, R. Cipolla, "Feature-based human face detection, "Image Vision Comput., vol.15, no.9, 1997, pp.713–735.

[6] An Analysis of Viola Jones algorithm for face detection by Yi-Quin Wang, University of Malaysia Phang, 2014, pp: 15-20.

[7] Implementation of Voila Jones Algorithm by Ole Helvig Jensen, university of Denmark, 2008, pp: 20-36

[8] "A Drowsy Driver Detection and Security System" Rajat Garg, Vikrant Gupta, ieeet Agrawal Department of Electronics and Communication VIT- University, Vellore- 600014, India {rajatgarg2006, vikrantgupta2006, vineetagrawal2006} @ vit.ac.in 9781-4244-3941-6/09/$25.00 ©2009 IEEE

[9] Multi-parametric Analysis of Sensory Data Collected from Automotive Drivers forBuilding a Safety-Critical Wearable Computing System Rajiv Ranjan Singhi, Rahul Banetjee2 iElectrical and Electronics Engineering Group, 2 Computer Science & information Systems Group Birla Institute of Technology & Science Pilani, Rajasthan, India 978-1-4244- 6349-7/10/$26.00 ©201 0 IEEE

[10] "Distributed Sensor for Steering Wheel Grip Force Measurement in Driver Fatigue Detection" Federico Baronti, Francesco Lenzi. 978-3-981-5-5/ DATE09 © 2009 EDAA

[11] ROC Analysis of a Fatigue Classifier for Vehicular Drivers Mahesh M Bundele Department of Computer Science Babasaheb Naik College of Engineering Pusad-445215, (MS) India 978-1-4244-5164-7/10/$26.00 ©2010 IEEE

[12] Detection of Driver Fatigue Caused by Sleep Deprivation Ji Hyun Yang, Zhi-Hong Mao, Member, IEEE, Louis Tijerina, Tom Pilutti, Joseph F. Coughlin, and Eric Feron IEEE TRANSACTIONS ON SYSTEMS, MAN, AND CYBERNETICS—PART A: SYSTEMS AND HUMANS, VOL. 39, NO. 4, JULY 2009

[13] Estimating Driving Performance Based on EG Spectrum Analysis 978-1-4244-6349-7/10/$26.00 ©201 0 IEEE

[14] W.B. Horng, C.Y. Chen, Y. Chang. (2004). Driver fatigue detection based on eye tracking and dynamic template matching. Proceedings of IEEE Intl. Conference on Networking, Sensing and Control, Taipei, Taiwan.

[15] T.C. Chieh, M.M Mustafa, A. Hussain, E. Zahedi, Burhanuddin. (2003). Driver Fatigue detection using steering grip force. Proceedings of SCORed, Malaysia.

[16] Detecting Driver Fatigue based on the Driver's Response Pattern and the Front View Environment of an Automobile Youngjae Kim, Youmin Kim, Minsoo Hahn Digital Media Lab, Information and Communications University {youngjae, ym_kim, 978-0-7695-3433-6/08 $25.00 © 2008 IEEE DOI 10.1109/ISUC.2008.58237

[17] Development of a Brand New System using RFID Combining with Wireless Sensor Network (WSNs) for Real time Doze Alarm Po-Ying Chen, Po-Han Wu, Woei Jye Ong Department of Information Tech. I-Shou University Kaohsiung county, Taiwan (R.O.C.)

[18] Jayasenan J, Smitha P, Driver Drowsiness Detection System, Journal of VLSI and Signal Processing, Volume 4, Issue 1, Ver. I (Jan. 2014),

[19] Kanchan, Manohar Sontakke, Efficient Driver Fatigue Detection and Alerting System, International Journal of Scientific and Research Publications, Volume 5, Issue 7, July 2015.

[20] K.Srijayathi, M.Vedachary, Implementation of the Driver Drowsiness Detection System, International Journal of Science, Engineering and Technology Research (IJSETR), Volume 2, Issue 9, September 2013

[21] Vandna Saini, Rekha Saini, Driver Drowsiness Detection System and Techniques: A Review, International Journal of Computer Science and Information Technologies, Vol. 5 (3) , 2014, 4245- 4249.

[22] Arun Sahayadhas , Kenneth Sundaraj and Murugappan Murugappan, Detecting Driver Drowsiness Based on Sensors: A Review,Sensors2012,12,16937-16953; doi:10.3390/ s121216937, ISSN 1424-8220.