International Journal for Research in Engineering Application & Management (IJREAM)
ISSN : 2454-9150 Vol-04, Issue-02, May 2018

Achieve Road Safety by Detecting Drowsiness Using Raspberry PI Kit

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Abstract - Now a days drowsiness is one of the major causes for highway accidents. Approximate 20% of all traffic accidents are due to the diminished level of attention caused by fatigue. accident due to drowsy is controlled when the vehicle is out of control. By using eye blinks of the driver we can detect that the driver is drowsy or not . These types of accidents occurred due to drowsy and when driver wakes he/she is not able to control the vehicle. The drowsiness is identified by the eye blink closure and blinking frequency through Raspberry Pi camera worn by driver by means of spectacles frame. The alcohol consumption is also verified during the starting process of the vehicle using alcohol detector. The buzzer will indicates that the driver is drunk or not and if yes then the vehicle doesn't allow the driver to start the vehicle. If the driver is drowsy, then the system will give buzzer signal and the speed of the vehicle is reduced and the obstacle sensor will senses the adjacent vehicle to avoid collision with that, and if there is no vehicle in left adjacent side then the vehicle move to the left end of the road by auto steering and controlling and vehicle will be parked with prior indications.

Keywords: **Face Detection ,Eye Detection , Geometric Rotation , Region of Interest.**

I. INTRODUCTION

Now a days road accidents are the major reasons for major injuries and death .As per the research road accident rate all over the world is 74% . According to the National Highway Traffic Safety Administration of the United States of America (USA), starting from 2005 there were an estimated 100,000 police reported crashes per year, caused by driver drowsiness . This resulted in an estimated 1,550 deaths, 71,000 injuries, and $12.5 billion monetary losses [6]. There are numerous non-driver related causes of road accidents including road conditions, the weather and the mechanical performance of a vehicle . Mostly number of road accidents are caused by driver error. Driver error includes drunkenness, fatigue, and drowsiness. [1]. Driver drowsiness is one of the primary causes of severe car accidents on road. Accordingly, real-time monitoring of drivers and timely intervention is getting more and more attention in car industry along with the explosive emergence of "smart technologies". These technologies are apply to monitor and detect drowsiness.[2] This paper presents a solution for minimizing the road accident caused by the drowsiness of driver by alerting through a single camera placed on the dash board of vehicle. Smart vehicle vendors have developed this technology by applying different techniques. The algorithm of eye detection system integrated with hardware to develop the smart vehicles, which can implement nationwide to avoid the road accidents. Raspberry pi and camera are used to make and intelligent hardware and software integrated system.[3]

Drowsiness is a state where a person sleep or almost likely. It alludes to a failure to keep awake or a drive to rest . Drowsiness and sleepiness considered in this paper as equivalent words. Although, in this paper sleepiness is utilized as apart of distinctive term as fatigue, which is a great tiredness because of physical and mental action. Drowsiness can likewise be depicted by the evaluation of alertness or vigilance. Attentiveness is the same as sharpness or a condition of sleep inability, while vigilance can be depicted as watchfulness or astate where one is readied for something to happen.[3].

Raspberry Pi's camera is used to detect the faces and eyes of drivers. One of the limitation relates to sunglasses. The face detection method, which is the Haar Cascade Classifier, will not work efficiently when the driver wears sunglasses. The Haar Cascade Classifier is trained to recognise persons with average or neutral skin colour. Moreover, an expectation of this paper is the suggestion of additional solutions and techniques, which the authors sincerely hope can help improve facial detection algorithms. Therefore, the authors gratefully allowed other programmers to solve the limitations in order to improve the efficiency of this work and any study related to the field.[1].

 DOI : 10.18231/2454-9150.2018.0114

II. PROBLEM STATEMENT

When a person is driving while feeling sleepy, the risk of getting into an accident is pretty high, as their reaction time, along with concentration and alertness, is significantly reduced, resulting in seriously impaired driving abilities.

III. PROPOSED SYSTEM

3.1 Introduction

Several accidentes are caused due to drowsiness and when vehicles are out of control. The accidentes are occurred due to drowsy and driver could not able to control the vehicle when he/she gets sensetions. The drowsiness is analyze by the eye blink closure rate through camera which is placed infront of driver. If the driver is in drowsy state then the kit will give buzzer signal and try to aleart driver. This paper involes the control of accidents due to unconscious through eye blink. To avoide the intrusion of sensors and microcontrollers the image processing is introdused. Open CV is a library of programming functions is being used in this system which supports capturing images from a camera. The pupil is located using centroid method for tracking purpose which will further used to analyze the drowsiness of driver.

IV. METHODOLOGY

The process of drowsiness detection means to capture different pictures of driver's face and then accurately calculate the level of drowsiness in drivers with real-time processing.

Proper materials should be selected to achieve these requirements. Research team selected Raspberry Pi 3 Model B to achieve these requirements. The Raspberry Pi camera was the visual device of choice and also hardware works in a best manner with well designed software. The research team chose Open CV library for its completeness and convenience for video and photo manipulation.

a) Face Detection

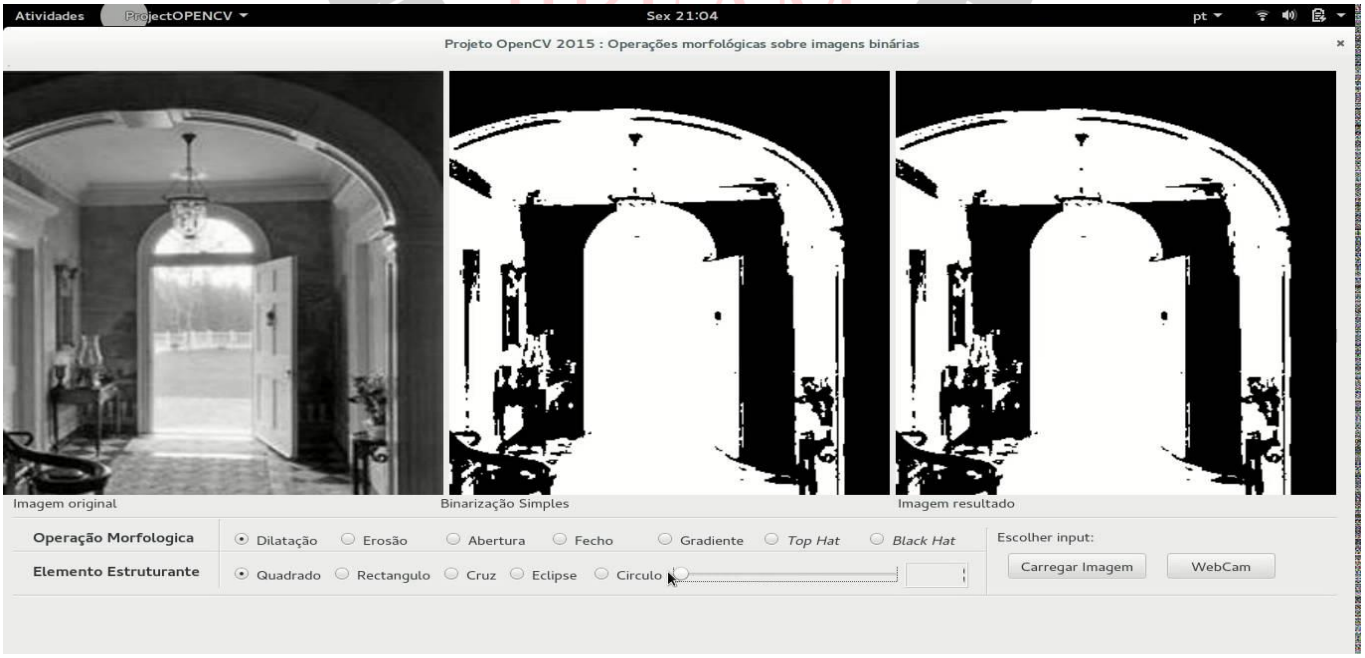
The camera will be open in continuous video mode, with this video sensor the driver face can be detected. Further, this is processed by Raspberry Pi 3 with the help of templets of Open CV. Driver's drowsiness level is detected by checking oval shape of iris.

b) Conversion of Image from Original to Gray

In this step the original image is converted into gray by using Open CV libarary. To differentiate the pixelwe are interested in form the rest, we perform a comparison of each pixel intensity value with respect to a threshold.

c) Gray to Binary

In this step the resultant Gray image is convered into binary by using Open CV libarary.



d) Erosion

The basic idea in binary morphology is to probe an image with a simple, pre-defined shape, drawqing conclusions on how this shape fits or misses the shapes in the image. This

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simple "probe" is called structuring element, and is itself a binary image.

e) Haar Cascade Classifier

Haar Cascade is a machine learning base approach where a cascade function is train from a lot of positive and negative images. It is then used to detect objects in other images. Initially , the algorithm needs a lot of positive images that is images of faces and negative images that is images without face to train the classifier then we need to extract features from it such as region of eyes.

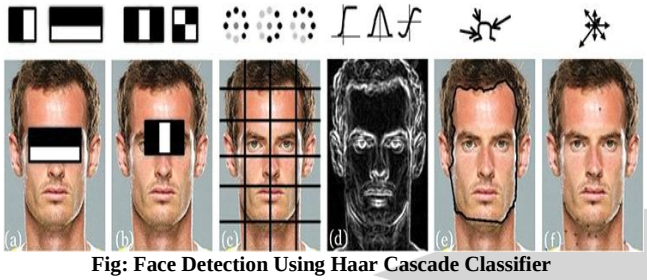


Fig: Face Detection Using Haar Cascade Classifier

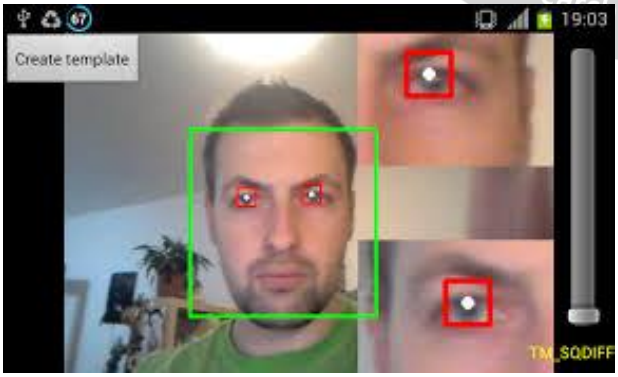
This method work efficiently in bright room. The Haar Cascade Classifier is used to detect the face with high accuracy rate. This method is applicable for both men and women.

f) Region Of Interest

After successful detection of face eyes need to be detected for further processing in our method eye is the decision parameter for finding the state of driver though detection of eye may be easier to locate but it's really quite complicated at this point it performs the detection of eye in the required particular region with the use of detection of several features. When eye detection is done then the result is matched with the reference or threshold value for deciding the state of driver .

g) Pupil Detection

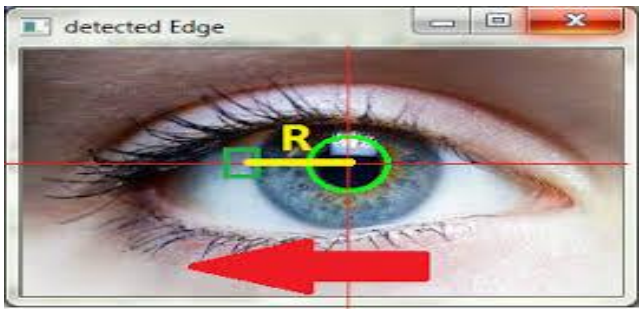
We are going to take a diffreent approach here. Pupil are too generic to take the Haar Cascade approach.
We can find pupil with the help of following functions



PupilFrame = cv2.equalizeHist(frame[y+(h*.25):(y+h),x:(x+w)])

h) State Of Eye

In this stage we find the actual stage of the eye that if it is close or open or semi-close or semi-open. The identification of eyes status is most important it is achieved by template matching .We channelize a warning message if we obtain that the eye are in open state or semi open state up to a particular threshold value. If the system detect that the eyes are open then the steps are repeated again and again until it find a closed eye.



V. System Requirement

A) Software Requirements
B) Hardware Components

A) Software Components

Raspberry Pi model supports JAVA and Open CV Version 3.1.0 library. Also the paper is done by using Windows and Linux OS. The Haar Cascade Classifier and template matching are supported in Open CV library.

B) Hardware Requirements

The Raspberry Pi 0 Kit and USB camera are used in this paper because they are small in size. The resolution of the camera is twelve megapixels. In addition, it is fast enough to capture in real time. Therefore, the authors only installed them by using a piece of carton. The processor Intel Core 2Duo Pentium 3 having speed 2.4 GHz is used . The hard disk being used in this setup is of 50GB . In this process real time processing is being used because driver can fall asleep while driving.

VI. Result

The system is tested by the Raspberry Pi of Dual Core 2.4GHz processor with 2GB RAM. The system can detect drowsiness accurately and alter the driver. The system is tested on 25 people and it generate more than 89% accurate result. The system can detect drowsiness at different levels. This levels consist of many cases such as complete eyes closed , partial closed eyes , one eye closed , right facing eye etc.

VII. Conclusion

The proposed system is used for driver safety by detecting drowsiness level and alerting driver. Driver Drowsiness Detection is one of the road safety technology to prevent accidents caused by the driver getting drowsy. Many research have shown that around 20% of all road accidents are caused by fatigue related problems and it may lead to severe physical injuries, death and economic losses. We conclude that by designing a drowsiness detection system to determine the drowsiness level of a driver. The

 DOI : 10.18231/2454-9150.2018.0114

numerous road accidents might then be avoided if an alert is send to driver who is feeling drowsy.

REFERENCES

[1] Driver Drowsiness Detection Using Eye-Closeness DetectionOraan Khunpisuth; Taweechai Chotchinasri; Varakorn Koschakosai; Narit Hnoohom 2016 12th International Conference on Signal-Image Technology & Internet-Based System (SITIS).

[2] Wu, Dongrui, et al. "Driver drowsiness estimation from EEG signals using online weighted adaptation regularization for regression (OwARR)." IEEE Transactions on Fuzzy Systems (2016).

[3] Eye behaviour based drowsiness detection system Javed Ahmedt, Jian-Ping Li1, Saeed Ahmed Kran2, Riaz Ahmed Shaik. School of Computer Science & Engineering, VESTC, Chengdu 611731, China 2 Departmnet of Electrical Engineering, Sukkur Institute of Business Administration, Sindh Pakistan.

[4] Chen, Liang-Bi, et al. "A wearable-glasses-based drowsiness-fatigue-detection system for improving road safety." Consumer Electronics, 2016 IEEE 5th Global Conference on. IEEE, 2016.

[5] An Algorithm for Automatic Detection of Drowsiness for Use in Wearable EEG Systems. Kwai C. A. Patrick, Syed Anas Imtiaz, Stuart Bowyer and Esther Rodriguez-Villegas.

[6] Standalone Wearable Driver Drowsiness Detection System in a Smart watch Boon-Leng Lee, Boon-Giin Lee, and Wan-Young Chung, Member, IEEE.

 DOI : 10.18231/2454-9150.2018.0114