|| Volume 5 ||Issue10 || October 2020 ||ISSN (Online) 2456-0774
INTERNATIONAL JOURNAL OF ADVANCE SCIENTIFIC RESEARCH AND ENGINEERING TRENDS

DRIVER DROWSINESS AND ACCIDENT DETECTION SYSTEM

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Abstract: - Drowsiness and Fatigue of drivers are amongst the significant causes of road accidents. Every year, they increase the amounts of deaths and fatalities injuries globally. In this paper, a module for Advanced Driver Assistance System (ADAS) is presented to reduce the number of accidents due to drivers fatigue and hence increase the transportation safety; this system deals with automatic driver drowsiness detection based on visual information and Artificial Intelligence. We propose an algorithm to locate, track, and analyze both the drivers face and eyes to measure PERCLOS, a scientifically supported measure of drowsiness associated with slow eye closure.

Keywords:-*Drowsiness detection, ADAS, Face Detection and Tracking, Eyes Detection and Tracking, Eye state, PERCLOS.*

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I INTRODUCTION

Driver fatigue is a significant factor in a large number of vehicle accidents. Recent statistics estimate that annually 1,200 deaths and 76,000 injuries can be attributed to fatigue related crashes. The development of technologies for detecting or preventing drowsiness at the wheel is a major challenge in the field of accident avoidance systems. Because of the hazard that drowsiness presents on the road, methods need to be developed for counteracting its affects. The aim of this project is to develop a prototype drowsiness detection system.

The focus will be placed on designing a system that will accurately monitor the open or closed state of the driver's eyes in real-time. By monitoring the eyes, it is believed that the symptoms of driver fatigue can be detected early enough to avoid a car accident. Detection of fatigue involves the observation of eye movements and blink patterns in a sequence of images of a face. [1]

In this paper, we are designing a module for ADAS (Advanced driver assistance System) is presented in order to reduce the number of accidents caused by driver fatigue and thus improve road safety. This system treats the automatic detection of driver drowsiness based on visual information. We propose a system to locate, track and analyse both the driver face and eyes to measure PERCLOS (percentage of eye closure).

II.PROBLEM STATEMENT

Drowsiness and Fatigue of drivers are amongst the significant causes of road accidents. A Computer Vision is used to monitor visual indicators of driver fatigue, allows the possibility of making fatigue detection system more affordable and portable. The proposed system is a user friendly. The camera is used to detect the region for drowsiness detection and alert drivers about dangerous driving conditions and behavior. The system also provides facility to alert registered contacts saved in the program, if an accident happens.

III. BLOCK DIAGRAM

System is divided into four modules: In Module 1,by using the pi camera we will capture the video of the drivers face. In module 2, Eyes are detected from the captured video and status of eyes also checked whether eyes are open or closed. In module 3, eye blinking ratio is calculated. In module 4, with the help of eye blinking ratio drowsiness is detected. After addressing the problems in literature survey related to drowsiness detection using Matlab, to get most similar result, Open CV is used for detecting drowsiness.

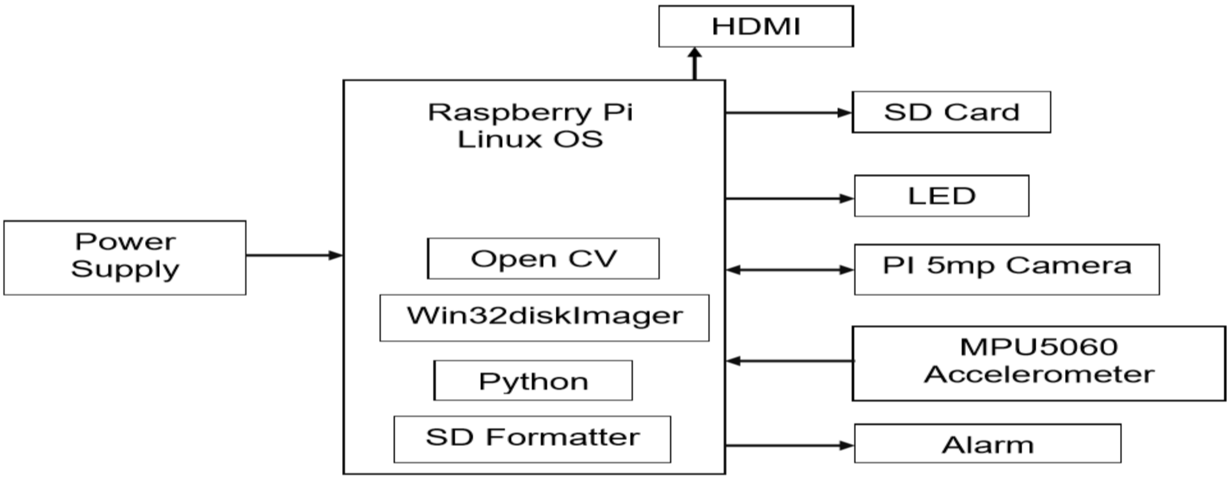


Figure 1 Block Diagram Of Drowness Detection System

Open CV based Drowsiness Detection is more effective than the Matlab based system. OpenCV was designed for computational efficiency and having a high focus on real-time image detection. OpenCV is coded with optimized C and can take work with multicore processors. Advantages of using Open CV are: 1) Every function and data structure has been designed with an Image Processing application in mind. 2) With OpenCV, we can get away with as little as 10mb RAM for a real-time application.

IV. SYSTEM ANALYSIS

To obtain the result a large number of videos were taken and their accuracy in determining eye blinks and drowsiness was tested. For this project we used a 0.3 megapixel webcam connected to the computer. The webcam required white LEDs attached to it for providing better illumination. In real time scenario, infrared LEDs should be used instead of white LEDs so that the system is non-intrusiveBuzzer is used to produce alert sound output in order to wake up the driver when drowsiness exceeds a certain threshold. The system was tested for different people in different ambient lighting conditions (daytime and night-time). When the webcam backlight was turned ON and the face is kept at an optimum distance, then the system is able to detect blinks as well as drowsiness with more than 90% accuracy. This is a good result and can be implemented in real-time systems as well.

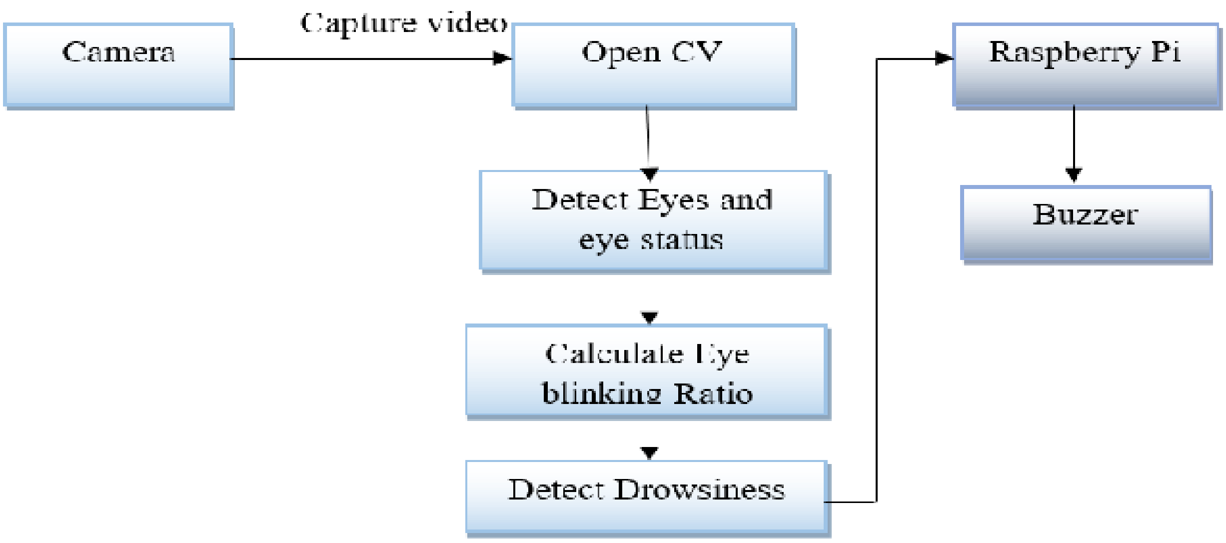


Figure 2. Flowchart of Drowsiness Detection System

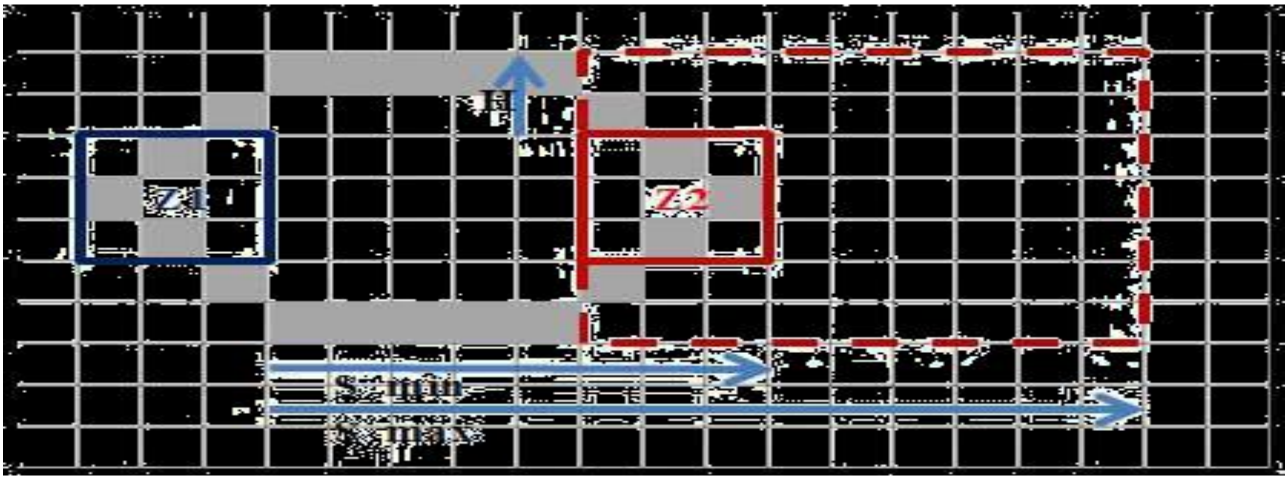
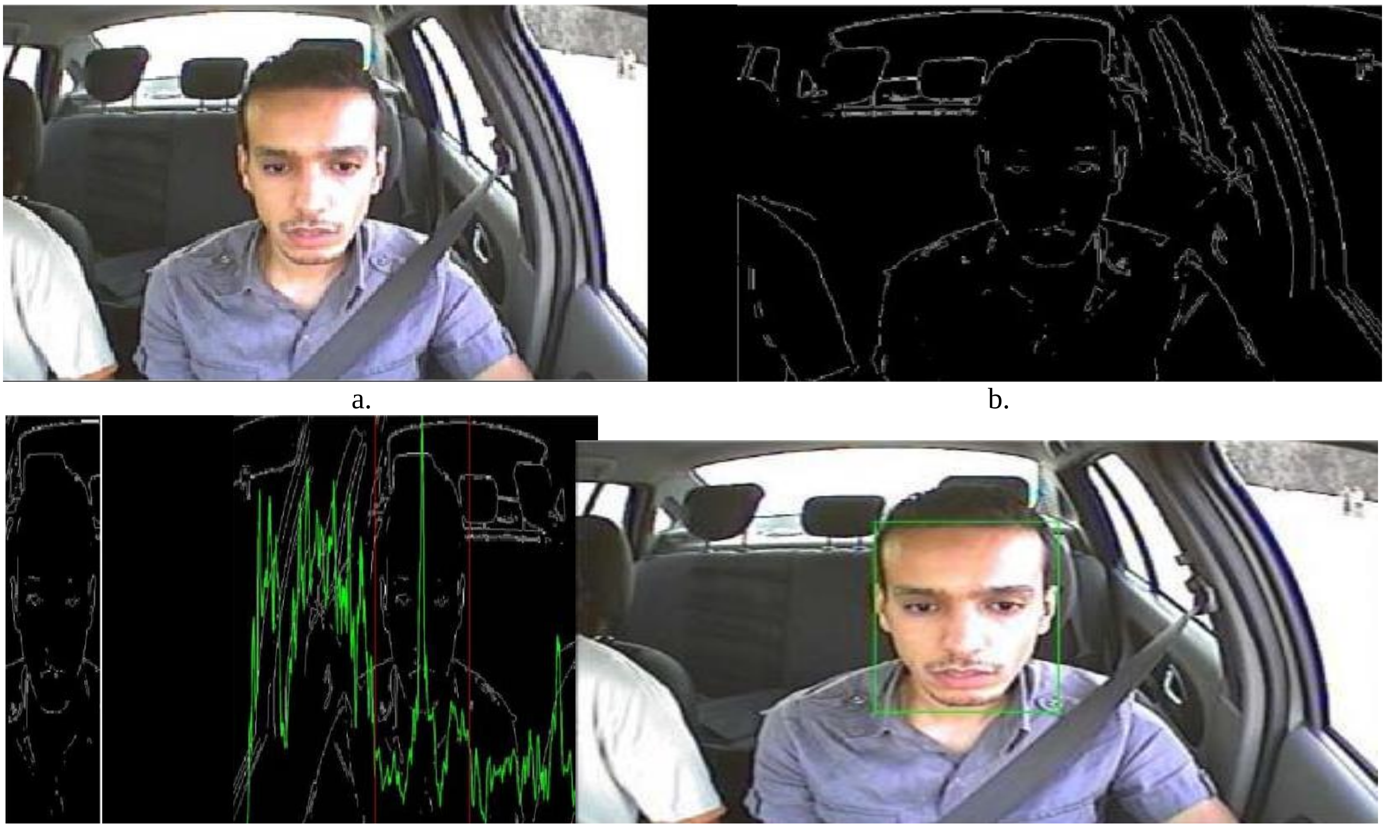


Figure4.1 : Sample example of eye

For each window Z1, we sweep the window Z2 in the area determined by the parameters S_min, S_max, and H. We increment the signal of symmetry between these two windows if the sum of white pixels is located between two thresholds S1 (maximum) and S2 (minimum). Then we extract the vertical region of the image contours (Region of Interest ROI) corresponding to the maximum index of the obtained signal of symmetry.

Next, we take a rectangle with an estimated size of face (Because the camera is fixed and the driver moves in a limited zone so we can estimate the size of the face using the camera focal length after the step of camera calibration) and we scan the ROI by searching the region that contains the maximum energy corresponding to the face (Figure 2)



a. b.

d. e. f.

Figure 4.2 – Face detection using symmetry. (a) Original image, (b) Edge detection, (c) Symmetry signal,(d) Localization of the maximum of symmetry, (e) Region of interest ROI (f) Result. Drowsiness Detection System

Eyes State

4.1.2 Eyes Localization-

Since the eyes are always in a defined area in the face (facial anthropometric properties), we limit our research in the area between the forehead and the mouth (Eye Region of Interest 'eROI') (Figure 4.a). We benefit from the symmetrical characteristic of the eyes to detect them in the face.

First, we sweep vertically the eROI by a rectangular mask with an estimated height of height of the eye and a width equal to the width of the face, and we calculate the symmetry. The eye area corresponds to the position which has a high measurement of symmetry. Then, in this obtained region, we calculate the symmetry again in both left and right sides. The highest value corresponds to the center of the eye. The result is shown in Figure 4.b.

Region of interest

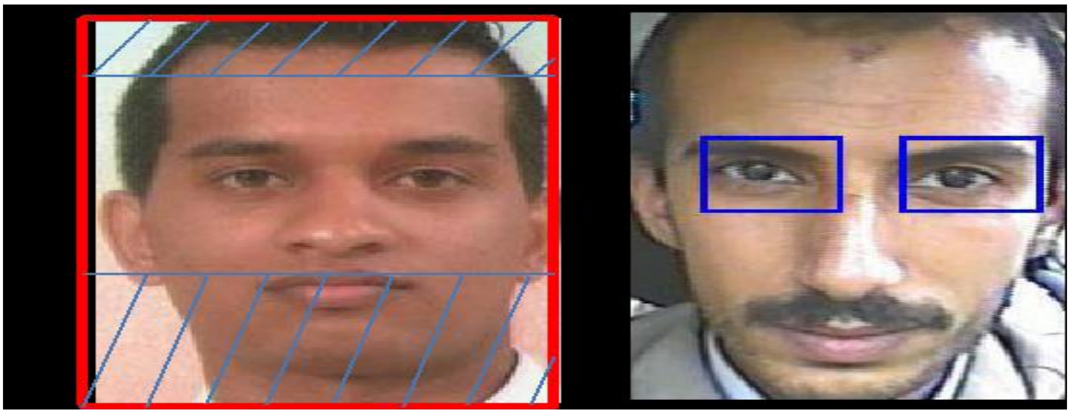


Figure 4.3 – Eyes localization using symmetry. (a) eROI,(b) Result.

4.1.3. Tracking

The tracking is done by Template Matching using the SAD Algorithm(Sum of Absolute Differences We proposed to make a regular update of the reference model M to adjust it every time when light conditions changes while driving, by making a tracking test:

The determination of the eye state is to classify the eye into two states: open or closed. We use the Hough transform for circles [13] (HTC) on the image of the eye to detect the iris. For that, we apply the HTC to the edge image of the eye to detect the circles with defined rays, and we take at the end the circle which has the highest value in the accumulator of Hough for all the rays. Then, we apply the logical 'AND' logic between edges image and complete circle obtained by the HTC by measuring the intersection level between them "S".

4.2 Experimental Results

4.2.1 Face Detection of Sample Images

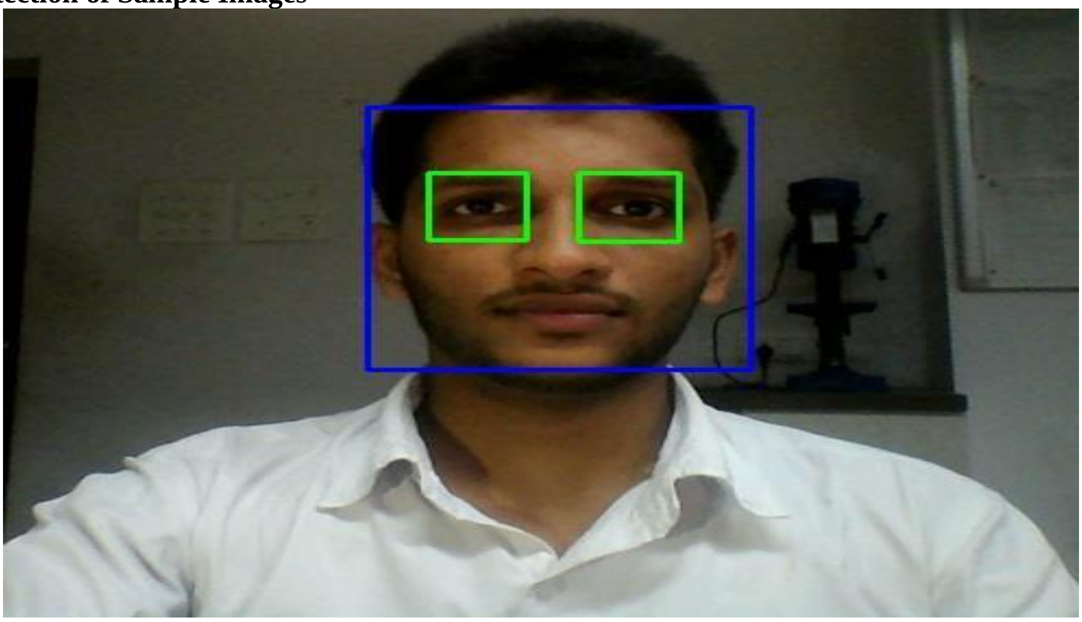


Fig .4.4 Sample Input Image 1

Fig. 4.5 Output 1

VIII. CONCLUSION

We propose a drowsiness detection method using the cross-correlation between distance and gradient vectors. We first detect a human face based on the Haar features. The eye region can be approximately determined within the detected facial region. Within the eye region, we locate a dark circular object that corresponds to a pupil. Since the distance and gradient vectors are normalized in the computation of cross-correlation, the method works well regardless of the intensities of an input image.

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