Intelligent Alarm System for Dozing Driver using Hough transformation

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***Abstract* - In today's world, we came to know large number of techniques like navigation systems and warning alarm systems that assist driver and make driving an easy job. Traffic accidents due to human errors cause many deaths and injuries around the world. Drowsiness and sleeping while driving are now identified as one of the reasons behind fatal crashes and highway accidents caused by drivers. There are some techniques already available in the market. It is a necessary step to come with an efficient technique to detect drowsiness as soon as driver feels sleepy. This could save large number of accidents. This research provides efficient technique for detecting driver's drowsiness. After acquiring image, focus has been made on eyes of driver using Viola-jones eye tracking method, after face detection. Edges have been extracted from the eyes detected. Using Hough transformation, iris has been extracted and then the states of the eyes used to detect drowsiness of driver. Experiments have been done on large number of drivers. Comparison of results with existing systems show that the implemented method gives desired output and it is better than existing systems.**

***Keywords* - Eyes detection, Eyes tracking, Edge Detection, Hough Transformation, Drowsiness detection**

I. INTRODUCTION

The increasing number of traffic accidents due to a driver's diminished vigilance level has become a serious problem for society. Some of these accidents are the result of the driver's medical condition. However, a majority of these accidents are related to driver fatigue, drowsiness of drivers. Car accidents associated with driver fatigue are more likely to be serious, leading to serious injuries and deaths. It has been estimated that drowsiness causes between 10% and 20% of traffic accidents with dead [4] and injured drivers [5], whereas the trucking industry shows 57% of fatal truck accidents for this fatality [6, 7]. Fletcher et al. in [8] goes further and has mentioned that 30% of all traffic accidents have been caused by drowsiness and Brandt et al. [9] presents statistics in which 20% of all accidents are caused by fatigue and inattention. In USA drowsiness is responsible for 100,000 traffic accidents whose costs are about $12,000 million [10]. In Germany, one of four traffic accidents have their origin in drowsiness, in England 20% off all traffic accidents are produced by drowsiness [11] and in Australia 1,500 million dollars has been spent on this fatality [12]. One of the most important factors in accidents, especially on rural roads, is the driver fatigue and monotony. Fatigue reduces driver perceptions and decision making capability to control the vehicle.

II. BACKGROUND

To overcome these problems many researchers had made systems to detect drowsiness. Advanced Driver Assistance System [1] has been approached very good results. They had used different algorithms and different techniques for every step. Like, for face detection, eye detection and tracking. They also had used neural network to train system for face detection. This system gives result on base of three different results. So they consider three different tables for results. It is a little time consuming process. There are three tables for face, eyes and tracking. They alarm the driver. This system gives false alarm sometimes. As usual this system does not work when driver wears sun glasses. look another system for drowsiness detection. A nonintrusive prototype computer vision system for monitoring a driver's vigilance in real time is proposed [2]. They give result on base of PERCLOS (percent eye closure) and five other features of face. They monitor visual behaviours that characterize a driver's level of vigilance. This system works efficiently in low light conditions. They detect pupils for drowsiness detection. But there is a problem when they use Kalman filter for pupil detection and tracking that time it detect unnecessary things also. Because of this reason it gives false alarm sometimes. Another drawback is that while driving driver moves head and system cannot detect pupil that time it gives alarm of drowsiness.

A. Methodology

An assumption has been made that the system containing camera with enough resolution has already been kept in front of the driver in a car. The intensity of light is enough to capture video for analysis.

As shown in figure 11 there is a methodology for a drowsiness detection system and it described separately below that figure. In description step by step process of this system has been shown and how it works also has been described.

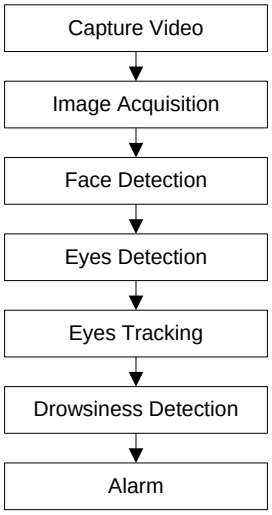

Figure 1: Methodology

a. Capture Video

In this step they put a camera in car or vehicle. And capture continuous video of driver. This video is sent in system for processing on it. This live video is the main source of any drowsiness detection system because without image of driver no one can detect fatigue. For capture video we can use any type of camera like 2MP to high definition camera.

b. Image Acquisition

After getting live video of driver as an input in the drowsiness detection system they convert video in frames. These frames are now input of system. Various algorithms can be used on these frames according to their need. These frames are the images of driver.

c. Face Detection

Using Viola-Jones algorithm face detection can be done.

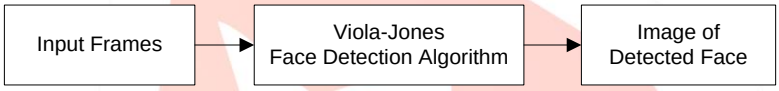

Figure 2: Face detection Method

d. Eye Detection

Using same viola-Jones algorithm eye also can detect. After detecting face eyes part will be detected easily. These eyes images will be cropped and used for next step.

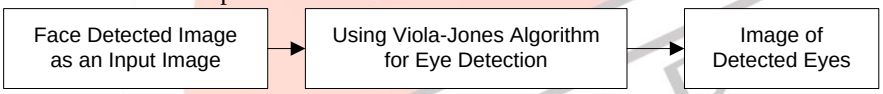

Figure 3: Eye Detection Method

e. Eyes tracking

Eye tracking is the process of measuring either the point of gaze (where one is looking) or the motion of an eye relative to the head. An eye tracker is a device for measuring eye positions and eye movement. Figure 4 shows eye tracking process using viola-Jones method.

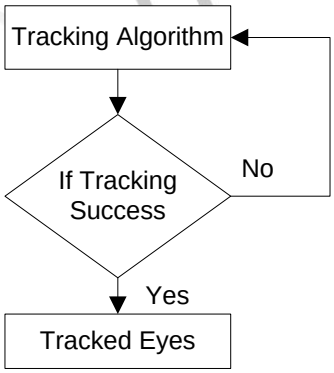

Figure 4: Eye tracking process

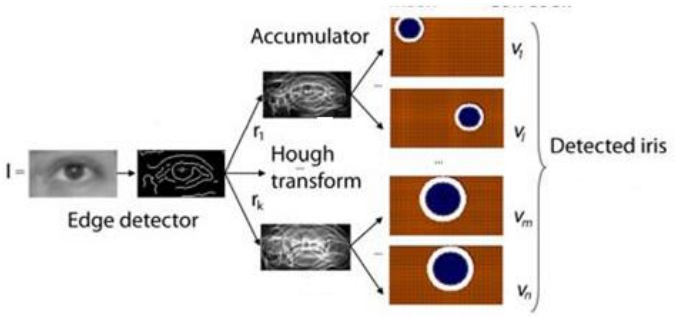

Figure 5: Drowsiness detection method

f. Drowsiness Detection

After getting crop image of eyes, find drowsiness detection. Apply canny edge detector to get edges of upper and lower eye lids. And also get circle of iris. Using Hough transform or may be any iris circler find algorithm we get iris. For drowsiness detection we can use iris tracking. In iris tracking if we don't find iris image then driver's eyes are closed. And in measurement of drowsiness detection if eyes remain closed for some threshold time then alarm the driver of dozing.

III. EXPERIMENTAL RESULTS

If system found drowsy frames more than threshold value than it alarms the driver. This drowsiness detection system has been tried on more than one use and gives very good results which have been shown in result part. There are some screenshots have been taken and shown below figures.

In these screenshots we can see that when driver is driving with full conscious that time system shows eye is open figure 6. Sometime driver closed eyes for some while but not for the threshold time than system shows eye is closed but normal figure 7. When driver came in the state of drowsiness that time system shows eye is closed and drowsy figure 8.

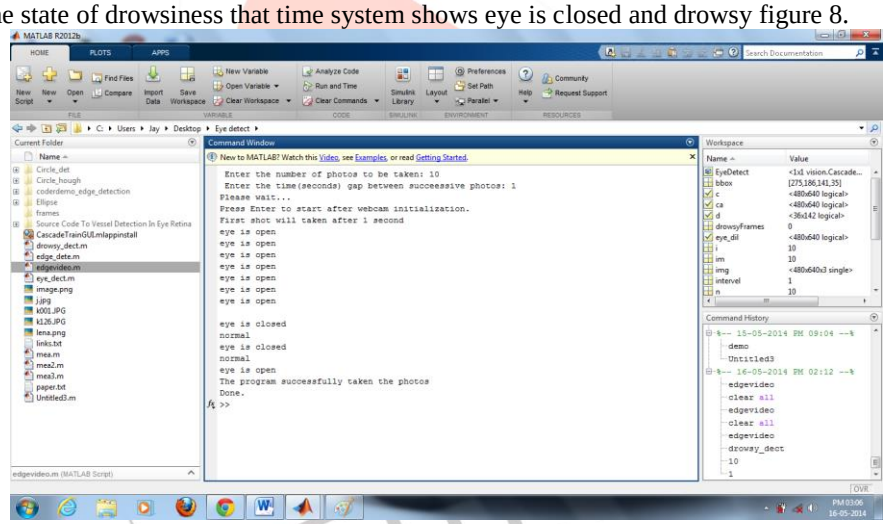

Figure 6: Working System

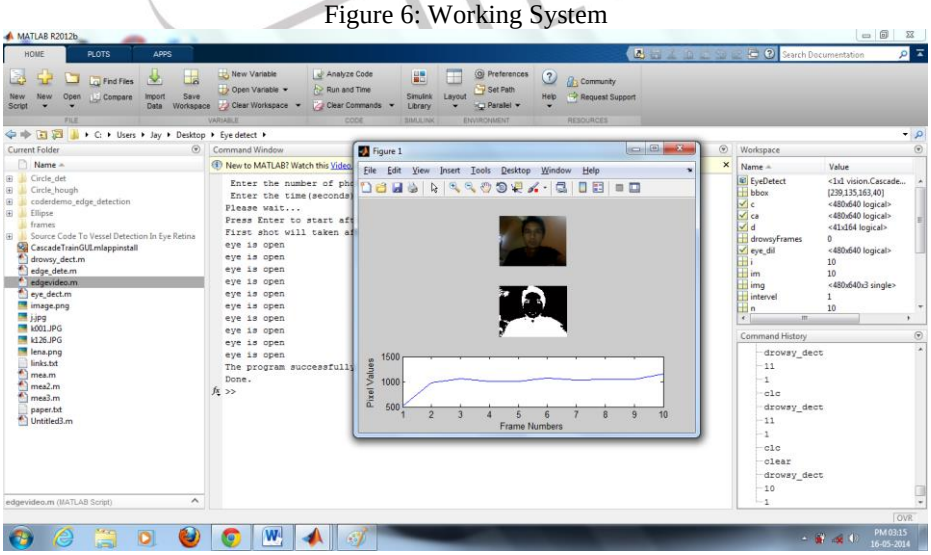

Figure 7: Working System

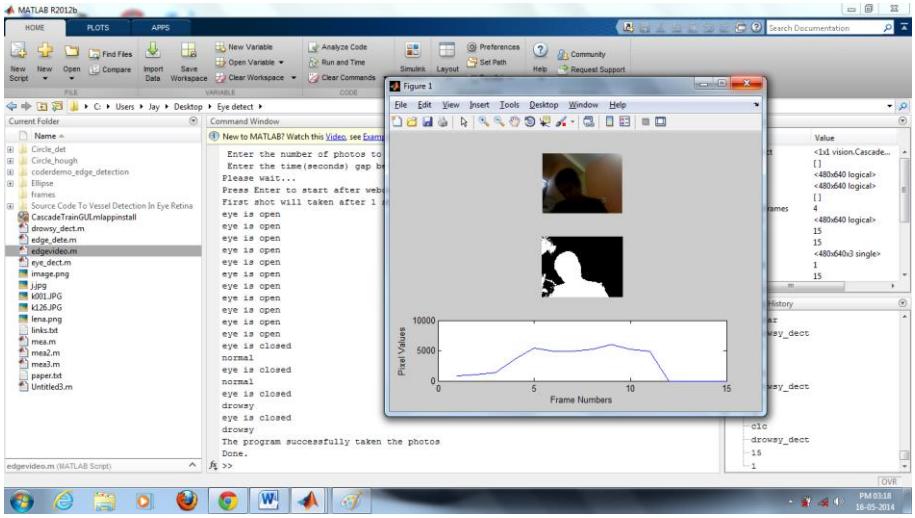

Figure 8: Working System

By applying this system for drowsiness detection we get improve result as shown in table 1.

Table 1: Result of drowsiness detection system

Driver	Total Frames	Eyes Open	Correct Rate	Eyes Close	Correct Rate
D1	1000	694/700	99.14%	398/300	99.33%
D2	800	551/560	98.39%	237/240	98.75%
D3	930	630/651	96.77%	270/279	96.77%
D4	700	460/490	93.88%	198/210	94.29%

IV. CONCLUSION

After implementing this drowsiness detection technique, we can conclude that eye tracking technique and edge detection technique are more useful to detect drowsiness. Hough transformation is more suitable for iris detection. This system gives better result than old system which has been shown in result.

There is one drawback in this system is it can't work on driver with spectacles. In future work, try to use this system on driver with spectacles.

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