Driver Drowsiness Detection System Using Image Processing

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Abstract - *We propose to diminish the number of disasters realized by driver weariness and along these lines improve road prosperity. This structure treats the modified disclosure of driver sluggishness subject to visual information what's more, man-made awareness. We discover, track and explore both the driver face and eyes to measure PERCLOS (level of eye end) with Softmax for neural trade work. It will be in like manner uses liqour and beat acknowledgement to take a gander at the individual is average or odd. Driver's exhaustion is one of the huge purposes behind car crashes, particularly for drivers of gigantic vehicles (for instance, transports and overpowering trucks) due to deferred driving periods and weakness in included conditions. This method can be inferred as a low cost and reliable way to minimize the number of injuries related to the driver's drowsiness in order to improve the health of travel.*

Key Words: Raspberry Pi, Eye tracking, Driver, Image Processing.

1. INTRODUCTION

The tendency of drivers to fall asleep is one of the main causes of road accidents. The data from various countries shows that around 20 percent of road injuries are a result of road accidents which are caused by the drivers falling asleep while driving. It is evident that the number of fatalities in road accidents is in a great way contributed by this hazard of drivers falling asleep when driving. Consumption of alcohol, fatigue during driving and a casual approach to driving are the main contributors to this risky behavior. It is due to this that, several people across various nations are adversely impacted. It is monitoring of drivers for drowsiness that will be an important tool in training and controlling the behavior of drivers to fall asleep when driving. It is this monitoring tool that will give an early warning of the tendency of a driver to fall asleep and prevent an accident. This paper presents a project for monitoring the sleepiness of a driver that is liable to cause an accident. The technology used is Open CV, Raspberry Pi and Image Processing. There is imperial evidence to show that there are various possibilities that can be implemented to detect sleepiness within the drivers. The measurement of sleepiness can be done by using eye response, vital biological parameters and the effectiveness of driving itself. Of these, eye response and biological monitoring are more reliable forms of measurement. However, biological parameter measurement is part invasive in nature requiring probes and direct physical measurement which has limited practicality. The advantage of monitoring the driver's eye response is that there is no probe or physical contact required with the driver besides it being completely non-disturbing kind of a measurement. Absence of any interference, disturbance, attachment of probes and ease of implementation makes monitoring of eyes for closure patterns the best tool to detect sleepiness of a driver. The data of eye closure gathered can be used in an algorithm that can correlate the pattern of eye closure to detect the sleepiness or otherwise of a driver during active driving phases or also during rest intervals.

2. RELATED WORK

There has been a lot of development recently in the area of smart vehicle software. Due to the driver sleepiness by exhaustion, which also results in frequent accidents, research is being done in the area. In some research papers, an ensemble deep learning architecture has been proposed which not only looks at the eyes and mouth samples of the driver but also includes the fitness of the driver in the decision structure. [1] There are also some works in which eye retina detection and facial feature extraction is used. [2] Prevention of driver drowsiness is the main area of focus of all of these works.

The number one causes for driver sleepiness are fatigue, consumption of alcohol, all of which can be prevented by the use of technology, especially artificial intelligence. Furthermore, artificial intelligence has also been previously used to detect the rate at which the driver is becoming drowsy.[3]

There have also been more invasive ways of preventing driver sleepiness, which result in a more uncomfortable driving experience, hence the need for the proposed system. EEG has been used for the driver sleepiness detection. Here, raw EEG is taken and multiple functions are performed on it. [4]

3. PROPOSED METHODOLOGY

Given below is a flowchart that can quickly analyze the information to detect sleepiness of a driver. The number of framers for which the eyes are open and the number of frames for which the eyes are closed are both counted. If the number of frames with the eyes shut exceeds a certain predefined limit, then an alarm is generated on the screen cautioning of driver sleepiness. The device can detect sleepiness even if the driver is wearing glasses or the light in the car is dim. The flowchart in combination with the technology of Open CV used has enabled the detection reliably. In this algorithm, the frame of a driver is captured first. This is followed by detection of face and then detection of eye. The number of frames with the status of the eye condition is monitored. If the number of frames for which the eye condition is closed that is Drowsy_Eyes < 4, then it is inferred that the driver is not sleepy. On the other hand, if the number of frames for which the eyes are closed exceeds 4 consecutive frames, then it is inferred that the driver is sleepy. This counting and collection of frames is connected to a monitor and a buzzer where an alarm is generated regarding the drowsiness of the driver.

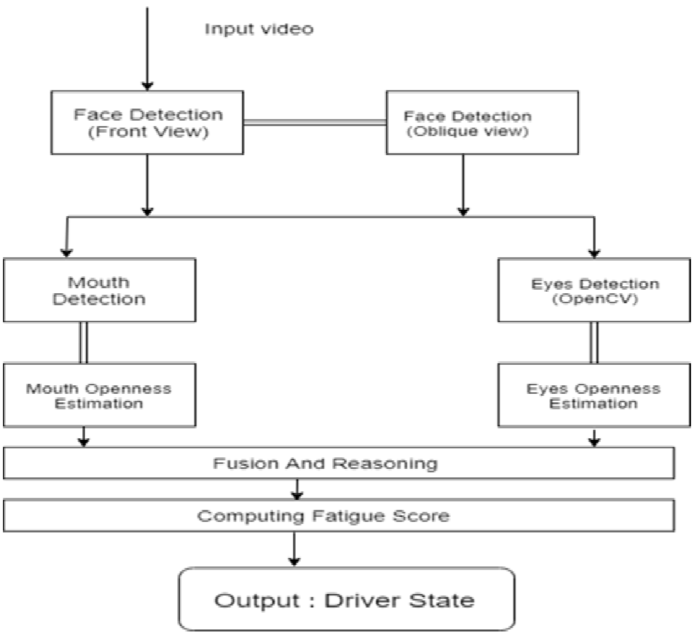

Fig -1: **flow chart**

3.1 Identification of Face

The proposed method would begin with one-by-one capturing of the video frames. OpenCV gives enough assistance for Live Video transmission. The device can identify the face for every frame in the frame picture. This device uses the Viola-Jones object detector which is a visual object detection solution to machine learning. Haar algorithm is used to detect the images of the face. Using stages cascade applications, Haar algorithm is capable of eliminating non-face candidates. So, each stage consists of a variety of different characteristics, and a Haar attribute classifier classifies each attribute in turn. The file "Haar cascade frontalface alt2.xml" built-in OpenCV xml is used to scan and identify the face in each photo. This file includes a variety of aspect features and is created from a combination of affirmative and negative samples.

The face frames are processed in an edge detection feature that eliminates other objects and isolates only the face for further processing. It is important for the face to be in the axis of the camera for the Haar algorithm to function effectively.

3.2 Identification of Eye

After the driver's face detection feature has been detected, the eye detection system attempts to detect the eyes of the car occupant. After face detection locate region of the eye by assuming that eyes are present only in the upper part of the face and from the top edge of the nose, extract eyes Region of Interest (ROI) by cropping mouth and head, we mark this region of interest. By considering the region of interest, the amount of processing required can be that and the processing can also be accelerated to get precise eyes.

Once again, the edge detection technique that was used in face identification is applied for the identification of the eyes only. Shape of the eyes is detected using ROI and Circular Hough Transformation is then used here to locate the shape of the eye. The Hough transform method enables expansive boundary definitions which are not influenced by aspects like noise of the image. This is unlike the edge detectors.

3.3 Identification of Sleepy Eyes

This technique involves counting the number of frames with open eyes after receiving the images of the detected eyes. The number of frames with the status of the eye condition can then be monitored. When the number of frames for which the eye condition is closed that is Drowsy_Eyes < 4, the driver is not sleepy. On the other hand, if the number of frames for which the eyes are closed exceeds 4 consecutive frames, then it is inferred that the driver is sleepy.

3.4 Identification of driver under influence of alcohol

As a pre-emptive check to one of the causes that contribute to driver sleepiness the detection of alcohol odour has been incorporated by inclusion of an alcohol sensor. This also triggers an alarm as a fore-warning to sleepiness.

4. EXPERIMENTAL RESULTS

This system for the detection of driver sleepiness does not involve any probes or other interferences that could distract or cause discomfort to the driver. It alarms that the driver is sleepy if the driver's eyes remain closed for more than approximately 2 seconds. It is also able to make out the difference between normal and natural blinking of the human eye as against the closing of eyes due to sleepiness.

Fig. 2 - (a) simulation result

The simulation results show the successful detection of the sleepiness of the driver as captured in the figure above. The upper part of the figure has not generated a drowsiness alarm when the eyes were closed for less than 2 seconds. Whereas, in the lower part of the image, sleepiness alarm has been appropriately generated.

4. CONCLUSIONS

The growing number of fatalities and road accidents have driver sleepiness as an underlying cause. The prevention of these fatal accidents would in turn require that driver sleepiness is reliably detected and relevant stakeholders are alarmed about the possibility of an untoward incident. The effectiveness of the proposed system would qualify it to be included as a standard feature in vehicles where the possibility of driver sleepiness exists. There is a huge potential to significantly reduce the number of road accidents and related fatalities using this or a similar system.

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