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Driver Distraction System using Face, Eye, Yawn And Pulse Detection

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Abstract: ***Secure car driving is an important entity for safety and is the first priority for any automobile driver and is the main reason for designing a system which captures the state of the drivers eyes and his/her facial variations combined with pulse fluctuations, altogether they gives us parameters to decide whether the driver should be notified or not. Eye detection - more precisely it analyses the eyes and check if they're closed or open using camera module the amount of frames during which eyes are closed is decided. When this number of frames is above a selected threshold, the drive will get a alert. Camera module periodically takes snaps so as to confirm safety..A true time system which captures the state of the driver which will benefit many of us round the globe.***

Keywords : Camera Module, drowsiness, Viola-Jones Human Machine Interface, Face Detection, Eye detection, Yawn detection, Distraction Detection, Alert Sound, Haar Cascade , Arduino , pulse sensor.

I. INTRODUCTION

Driver Distraction relates to unsatisfactory or no attention given to activities critical for driving. Inattentiveness can either be an intentional or an unintentional distraction of attention by the drive . Driving distraction causes traffic accidents. The increasing use of navigation systems and infotainment systems has led to an increase in driver distraction like talking on phone, taking note of loud music,or even traditional distractions like drowsiness and yawning are indications That needs motivating the drivers transfer attention faraway from the mundane driving task by weakening the drivers auditory, biomechanical, cognitive or visual faculties or combinations thereof. it is vital to note that driver distractions are normally because of a competing trigger activity which will cause driver inattention, which successively decrease driving performance. So so as to take care of the driving feasibility some parameters must be taken care of which comprises of mainly facial and retina variations of driver and his/her heartbeat or pulse because it's shown by some studies that a drivers heartbeat or pulse is higher while driving and is lowered during a fluctuating manner while sleep or distracted and this all parameters help us to formulate that whether the driving force is feeling fatigue or not.

By recognizing variety of the reason for driver distraction, it's possible to isolate scenarios when the rationale for distraction are going to be controlled. the bulk of road accidents nowadays are happening simply because of driver behavior and therefore the fault which may cause death and injuries, and are some of the main reasons for financial losses. Distracted driving sometimes put other drivers in danger as the drowsy driver not only put himself at risk but his/her carelessness may prove fatal for others also. One amongst the explanations for accidents on the road are fatigues of a driver. Hence due to such conditions there is a need of a compact system to predict the drivers behavior so fatal injuries and accidents can be tackled in real time. The given system can help for alerting the driving force when it's distracted. The system detects the face from captured images. If some distraction can happen then the constant sound is played. Driver status notification is distributed to the admin.

II. PRPOSED WORK

Most traffic accidents occur when the drivers fall asleep whilst driving. So it would be beneficial to develop how to detect the drowsiness in the drivers before it occurs and to be able to warn them in time. Many such systems have already been developed or are being developed which support the vehicle behaviour like wheel movements, that specialize in the driving force physical behavior i.e. using supported recording taken of head movements, pulse alteration or grasp strength. This system uses a video camera that tracks eye movements , which have also been developed. Until now no such system has proven to be sufficiently reliable. The existing system used the eye closure ratio as input parameter to detect the drowsiness of the drive . If the eye closing down ratio decreases from the traditional ratio, the drive is notified with the help of a alarm. For our system, a Pi camera module is employed to require the pictures of the driver's eye.

A. Abbreviations and Acronyms

Img-image
Hmi-human machine interface
Vj-viola jones
Ar-arduino IDE

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B. Equations

Haar algorithm features can easily be scaled by expanding or the size of the pixel group being inspected. As a result, this enables us to detect features on particular gestures. The variances of contrasts within the pixel groups are accustomed be told comparable light and dark areas. The feature value f of any single Haar feature with k rectangles will be elected by because the following equation

P≤ ((number of Pos.Img-number of Neg.Img)/(1+number ofstages-1))(1-min hit rate) ...{a}*

• Haar-like feature-based classifier gives both high precision & speed. It needs fewer microprocessor instructions & has much less false detections. the utilization of integral images causes the high speed of evaluation while rectangular property of the haar like features characterize non-symmetrical properties of Gesture appearance , so it's perfect for Gesture detection procedure.
• The rotated integral image are often calculated by calculating the entire value of the pixels' intensity values which are found at a forty-five-degree angle to the left & above for the x value & below for the y values.

II. IMPLEMENTATION

The Distraction system initially takes input using camera module and identify the driving force then it implies certain parameters to test the drowsiness of the driving force, system use the attention closure ratio as input parameter to detect the drowsiness of the driving force. If the attention closure ratio deteriorates from the quality ratio, the driving force is alerted with the assistance of a buzzer. Haar Cascade may be a machine learning algorithm accustomed identify objects in a very img or video when compared to viola- jones algorithm it is more compact and captures facial and retina movements, altogether the distraction system software harnesses haar cascade to differentiate between drowsy and normal features of driver and open CV platform provides a feasible way to harness the graphical input.

A. Open CV as a Raspberry pi- alternative

Raspberry Pi are often wont to perform various different tasks, but still there are some limitations found because of its hardware and its processor. It can't operate X86 operating systems. a number of the common OS like Windows and Linux distros don't seem to be compatible. Additionally, a couple of applications which have high demands on CPU processing power and usage can't be performed. "Model B took 107 ms to end one calculation of the purely synthetic prime test; a mid-range desktop Core 2 Duo E8400 took only 0.85ms." (Collins, 2012).
Total Operators mustn't use the standard computer standards to scope Raspberry Pi.

B. Haar Cascade Classifier

Haar Cascade might be a classifier which when employed, are often wont to detect a face from an image For training the classifier positive images which contain the specified object i.e. the face within the image and negative images which don't contain the face within the image are required. The classifier scans all the attributes on the positive images and creates specific target values by using the entire values of the black area and also the white areas within the attributes.
The classifier then tries to form the foremost optimized target values for locating and tracking the thing by changing the size of the attributes. Attributes are weak classifiers. this is often because they can't be an accurate classifier alone.
In an object, there are many features and a neighborhood where they're collected contains the wanted object within the image. employing tons of positive and negative images facilitates the detection of the item within the image.
The classifier runs as described above . Its rate of finding the objects inside the image wholly depends on the training method employed by the classifier and also on the amount of positive and negative images available. For training the Classifier , the positive and negative images are used. we will train the classifier by providing positive images separately keep up with their preferred choice. The positive images are resized up to a 24*24 pixels and are then converted to a vector file which features a script. then , the quantity of positive images which will be utilized in training is about . For the determination of this number [P], equation (a) is used.

C. Pusle monitering using arduino

There is a significant fluctuation variation in drivers pulse while driving and while sleepy and this is a observed fact during study conducted [12] and the most effective and affordable option to moniter heartbeat is using Arduino and pulse sensor the simple combination computes the drivers heartbeat while finger is placed and notifies if the pulse value is abnormal or out of bounds

D.Figures and Tables

TABLE I.

S.NO	Distraction system
	TOOL
1	CAMERA MODULE
2	OPEN CV
3	ANACONDA NAVIGATOR
4	ALARM
5	PULSE SENSOR
6	JUMPER WIRES
7	ARDUINO UNO BOARD
	DETECTION SYSTEM

[a.] System tools requirement

Fig. 1.Haar cascade features.

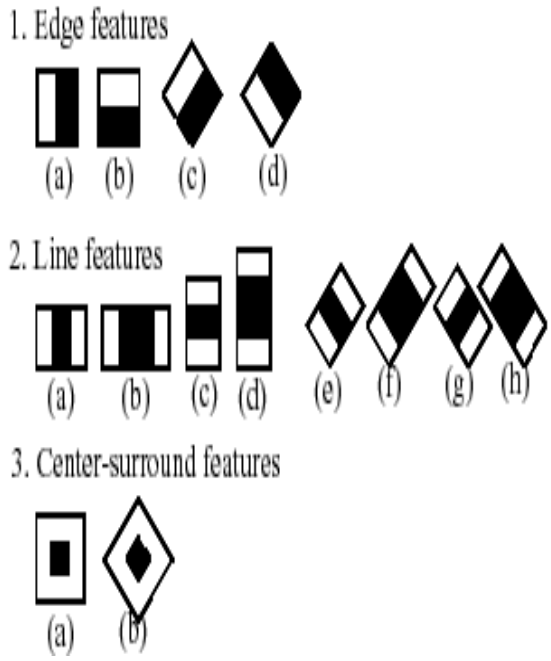


Fig. 2.Distraction system flow

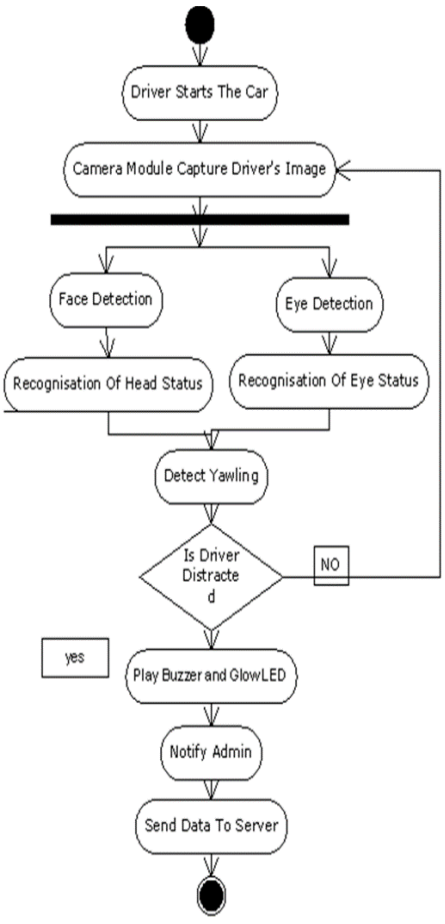
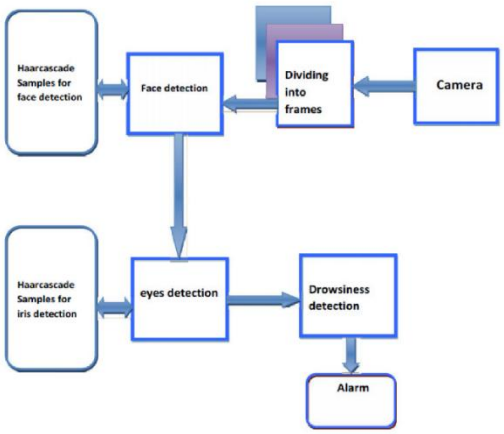


Figure 2: System Flow

Fig.3.System design

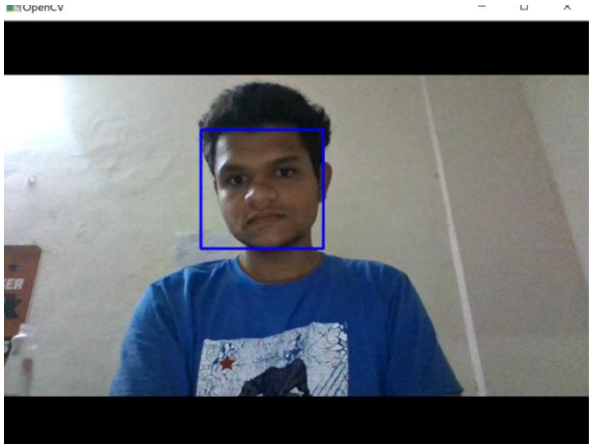


III.RESULTS DISCUSSION

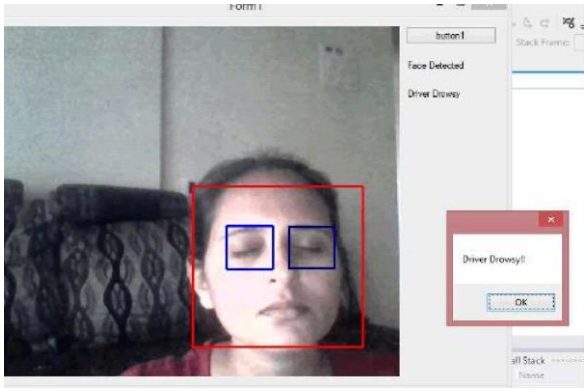
The model feasibly detects the face and eyes through camera module and using haar cascade repository it determines whether the driver is distracted or not and notifies the admin about the same and moniters pulse rate through pulse sensor connected to Arduino uno board and report any irregularities.

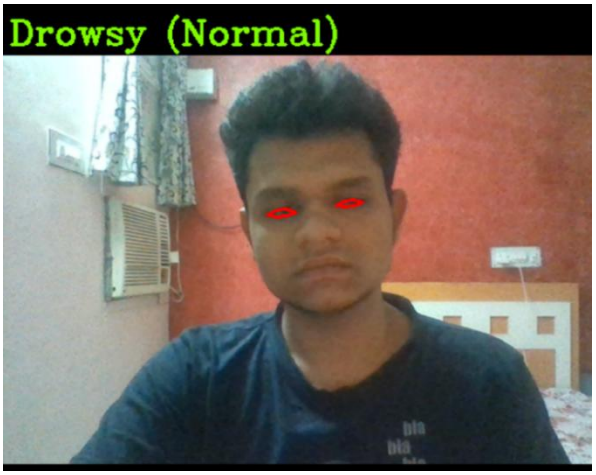
IV.OUTPUTS SCREENSHOTS

(1) Screenshots of the Facial detection :-

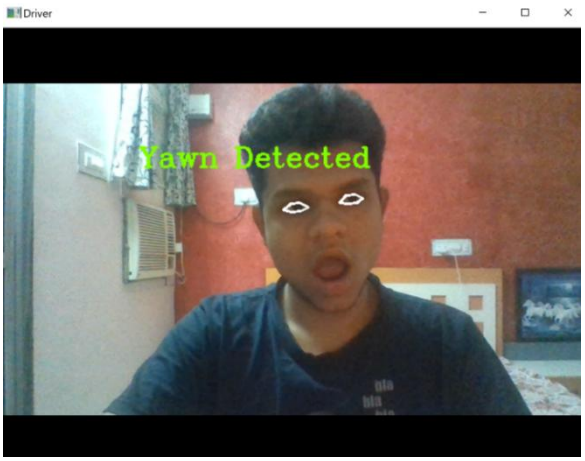


(2) Screenshots of the drowsiness detection :-



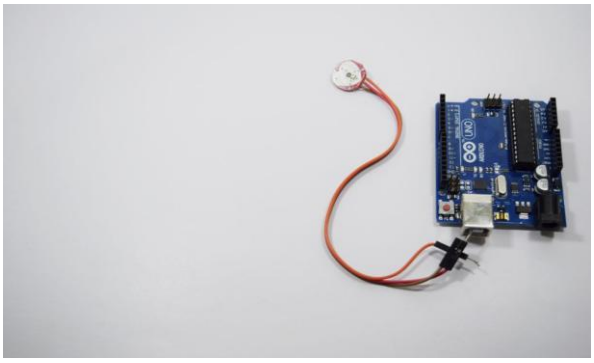


(3) Yawn Detection



(4) Arduino uno and Pulse Sensor assembly

(Pins are connected in ports viz A0 ,V1,GND)



V.CONCLUSION

The main objective of this paper is the creation of a real-time observation system in vehicles which will be henceforth used to monitor sleepiness in drivers. We have developed a straightforward structure which consists of a number of steps which are :-accession of video, divison of video into frames, facial detection, optical detection, pulse detection and sleepiness detection. Each of these steps are often presented separately hence providing how to stack them supported the requirementsFour things that produces our system different from the present driver detection system are concentrate on the driving force, which may be a straightforward way of observing and detecting the sleepiness, aka, a real-time system that will help us in detecting facial, optical , blinking, and driver drowsiness in a completely non-intrusive system. The system will be totally low costing as no hardware cost is required because of open CV compared to raspberry pi and use of Haar cascade algorithm makes our model different with collaboration of pulse monitering. Our model gives the knowledge about the driving force's bearing while driving and will alert us if the driver is yawning, sleeping or not concentrating on the road while driving The proposed system can estimate the gaze which is used to warn the drive. The system could warn the driving force to concentrate whenever the driver's gaze gets distracted on an edge apart from the road. The Haar cascade method is employed here to detect the face, for the attention part, the Jones algorithm which only detects frontal faces is employed .The Haar cascade also demonstrates better performance as compared to the Viola Jones performance i.e. Viola Jones performance cannot easily be estimated. Haar cascade includes an honest solution as compared to the Adaboost algorithm which can be a suboptimal solution. In future the warning mechanism are getting to tend within the type of visual, audio or some quite regeneration are often incorporated which can influence driving behavior during a very positive manner.The positive or negative abrupt fluctuations in heartbeat also indicates the drivers drowsiness and may be monitered easily using Arduino ide and pulse sensor and as this components are available at an inexpensive market cost the system is sort of affordable and adaptable.

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