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IOT based Alert System for Drivers

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Abstract: ***Today's world is moving world. Everyone becomes multi-tasker. They want to handle multiple tasks at a time. While driving also the do another work like talking on the phone or another person, chatting, also they face traffic problems. So it is necessary to be aware while driving. If the driver mind is distracted then it causes an accident.***
Today, 80% of death caused due to the accident and the main reason was the driver unawareness. To overcome this issue we need to aware while driving.
This article proposes the system for auto alerting the driver when it is distracted. The reviews a range of issues pertaining to driver modeling for the detection and assessment of distraction. The areas addressed include 1) understanding driver behavior and distraction, 2) maneuver recognition and distraction analysis, 3) glance behavior and visual tracking, and 4) mobile platform advancements for in-vehicle data collection and human-machine interface.
Keywords: Glance Behavior, Human Machine Interface, Face Detection, Distraction Detection, Alert Sound.

I. INTRODUCTION

Driver distraction [3][4][8] is defined as unsatisfactory or no attention given to activities critical for safe driving. Inattentiveness can either be an intentional or an unintentional distraction of attention by the driver. Driver distraction has been formally defined as anything that delays the recognition of information necessary to safely maintain the lateral and longitudinal control of the vehicle due to some action, object or person, inside or outside the vehicle. Driving distraction causes traffic accidents. The increasing use of navigation systems and infotainment systems has led to an increase in driver distraction. That requires encouraging the drivers shifting attention away from the fundamental driving task by compromising the drivers auditory, biomechanical, cognitive or visual faculties or combinations thereof. It is important to note that driver distractions are normally due to a competing trigger activity that may lead to driver inattention, which in turn decrease driving performance. Alternatively, other forms of driver distraction might not essentially be due to a trigger or competing activity, making inattention difficult to detect and even harder to control. By recognizing some of the reason for driver distraction, it is possible to isolate scenarios when the cause of distraction can be controlled.
The majority of road accidents nowadays are happening just because of driver behavior [5][6]and the fault which can cause death and injuries, and also reasons for financial losses and low productivity. The careless manners of the driver they moreover put other drivers at risk. One of the reasons for accidents on the road are fatigues of a driver. So there is needed to monitor driver behaviors in real time that can reduce fatalities and injuries and road accidents. The proposed system can help for alerting the driver when it is distracted. The system detects the face from captured images. If any distraction can happen then the continuous sound is played. Driver status notification is sent to the admin.

II. LITERATURE SURVEY

Shinko Y et al. [1] propose a novel real-time computer vision algorithm is used for the system which consists of a visible and near-infrared imaging device observing the front-row seat area in the vehicle. It is an alternative of detecting and tracking the hand movement and classifies the hand into respective classes. Christopher Cabrall et al.[2] gives Non-intrusive eye-tracking measures that evaluate driver states (i.e., distraction, drowsiness, and cognitive overload) automatically to trigger manual-to-automation ToC and serve as a driver readiness verification during automation- to-manual Toe. The system can detect gaze situation [8], gaze inconsistency, eyelid opening, as well as external environmental complexity from the driving scene to facilitate ToC in automated driving. Nanxiang Li et al. [3] investigates drivers' behaviors associated with visual and cognitive distractions, both separately and jointly. The scores from the perceptual estimation are intend to identify regression models with elastic net regularization and binary classifiers to separately estimate the cognitive and visual distraction levels. The analysis gives multimodal features that are discriminative of cognitive and visual distractions. Paper gives a novel joint visual-cognitive distraction space to characterize driver behaviors. Whui Kim et al. [4] propose a method to detect driver distraction using single Convolutional Neural Network models such as Inception ResNet and Mobile Net. The ILSVRC2012 pre-trained dataset consisting of images of two subjects are

explained. John H.L et al.[5] focuses on naturalistic driving studies, with the interest of understanding driver behavior and distraction from multichannel sensor data. The approach is to first extract the driving context in terms of micro-level components and then evaluate risky events and variations against similar driving patterns in the vehicle dynamics domain. An alternative approach is to directly monitor the driver's physical or glance behavior and assesses their cognitive and visual attention. To take advantage of the fast-growing smartphone applications market and integrate telemetric services, recent activities have resulted in a mobile platform that contributes to in-vehicle naturalistic driving studies and voice-based human-machine interfaces.

Lorraine Saju et al. [6] developed system i.e. a Driver Behavior Analysis Using Non - Invasive sensors using an ARM 7(LPC2129) controller as the main control unit and CAN bus a car. ARM 7 is used to obtain high performance. Use of CAN makes high-speed communication in control networks and also helps to share data between all nodes which results in enhancing their collaborative work. This system can detect ECG, eye blink and alcohol Detection. T.D Prasanthi et al.[7] propose a system i.e. Design of ARM-based face Recognition system using Open CV [8] library, the authors have implemented a system using ARM 7 based microcontroller and OpenCV based machine. This is interfaced to USB camera for continuous images are captured and these images are processed with the help of OpenCV and compared with the existing database. If the current images are matching with any of the existing images the system generates the command to the output unit to perform the location identification using GPS and provides the required information about the identified person using GSM/GPRS to concern authorities.

III. PROPOSED SYSTEM

Here we propose an IOT Based Alert System for Drivers which can help to detect distraction of driver while driving. The system can help to reduce road accidents, by detecting the causes such as drowsiness, fatigue and to alert the driver.

The system will help to increase passenger safety and give information about the driver's behavior while driving to the admin. With the help of Haar cascade eye and face are detected from the captured image. If the driver is found to be yawning or sleeping or distracted from driving, then the continuous sound is played to alert him using buzzer and notification is sent to the driver. Below figure shows the structural design of the proposed system.

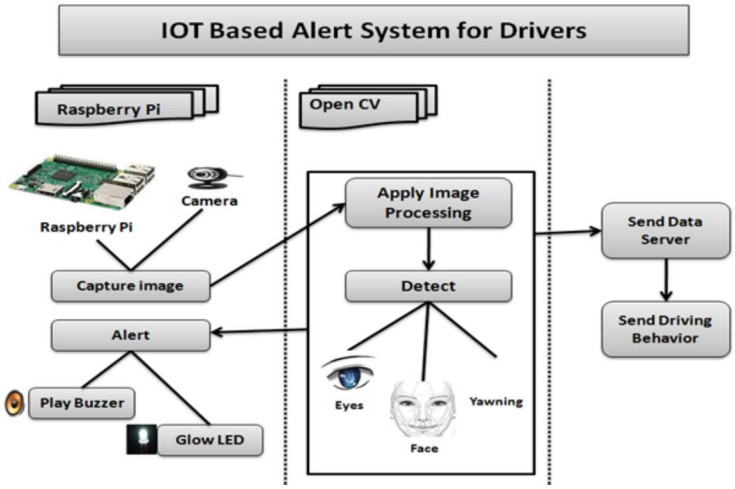

Figure 1: System Architecture

1) *Capture Image:* Raspberry pi based camera continuously captures the driver image and stores it on sd card. Capturing of images is done using Open CV and Java module.
2) *Detect Eyes:* Haar cascade is used to detect eye and face from the captured image. If a closed eye is found then an alert is made to driver.
3) *Detect Yawning:* Haar cascade is used to detect face from the captured image. Yawing is detected from the face image using eye, nose, and mouth order.
4) *Detect Distraction from Driving:* Project's primary aim is to identify alertness in driving. If the driver is found to be yawning or sleeping or distracted from driving, then continuous sound is played to alert him.
5) *Play Buzzer, Glow LED and Notify Admin:* Raspberry is connected to LED and buzzer modules. In case the driver is distracted, then buzzer is played and led glows
6) *Send Data to Server:* User driver statistics are synchronized to server.

A. System Flow

Figure 2 gives the detail flow of proposed system.

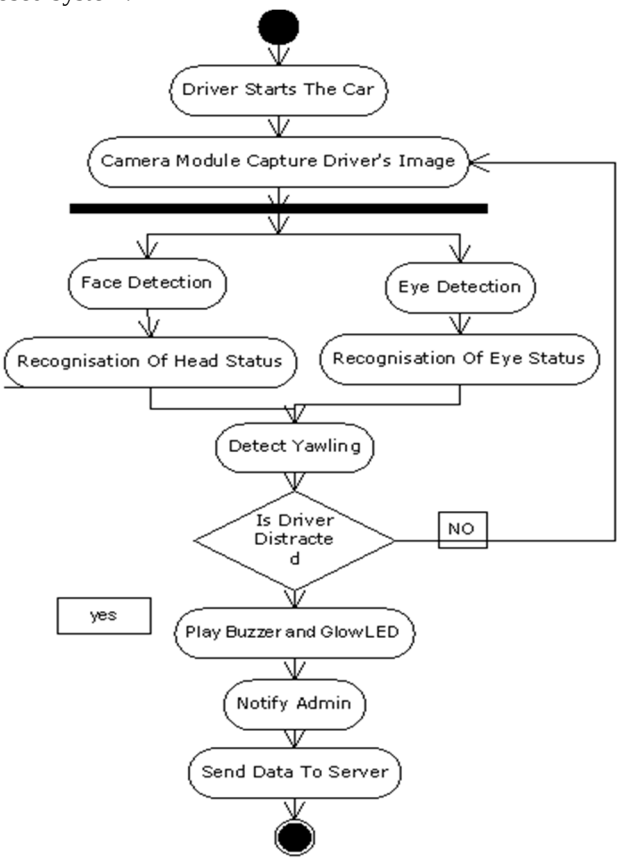

Figure 2: System Flow

IV. ALGORITHM USED

A. Haar Cascade Classifier

1) Haar Cascade is a classifier which is used for detecting a face from an image.

2) For training the classifier positive images which contain the wanted object i.e. face in the image and negative images which don't contain the face are needed. The classifier scans the features on the positive images and creates specific target values by using the sum values of the black area and the white areas in the features

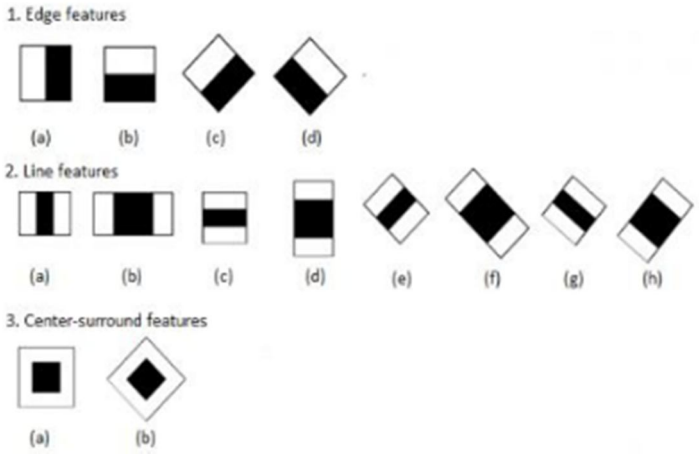

Fig. Features in the classifier

3) Classifier tries to create the most optimized target values for detecting and tracking the object by changing the sizes of the features. Features are the weak classifiers. Because they can't be a correct classifier with alone.

4) In an object, there are many features and a place where they are collected contains the wanted object in the image. Using a lot of positive and negative images facilitates the detection of the object in the image.

5) Classifier runs as mentioned above basically. Its speed of finding the objects in the image depends on the training method of the classifier and the number of positive and negative images. Training the Classifier for training the classifier positive and negative images are used. We train the classifier by giving positive images separately according to their type. The positive images are resized to 24*24 pixels and converted to a vector file with a script. After them, the number of positive images that will be used in training is determined. For determining this number (x) Equation (1) is used.

$$X \leq \frac{(\text{Number of Pos.Img.} - \text{Number of Neg.Img.})}{1+(\text{Number of Stages} - 1)*(1-\text{minhitRate})} \quad (1)$$

6) In this equation, the number of stages indicates that in how many stages the classifier reaches to the result and the minhitRate indicates the minimum hit rate in every stage.

7) First of them represents the acceptable maximum false alarm rate for the training section of the object. The second one represents the memory allocated for training the classifier. After the training section, the XML files are created for each object types. By using these files the objects can be detected and tracked.

V. EXPERIMENTAL RESULTS

The proposed system help to detect the driver's behavior while driving. The camera continuously capturing the drivers image and by applying image processing we can detect the alertness in driving. The experimental setup of the proposed system is as shown in below figure 3.

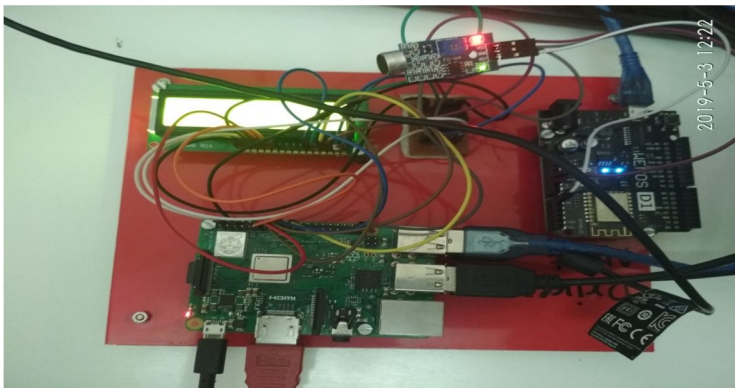

Figure 3: Experimental Setup

After detecting the face system detects the eyes and mouth. The LCD displays the message that driver is distracted or not.

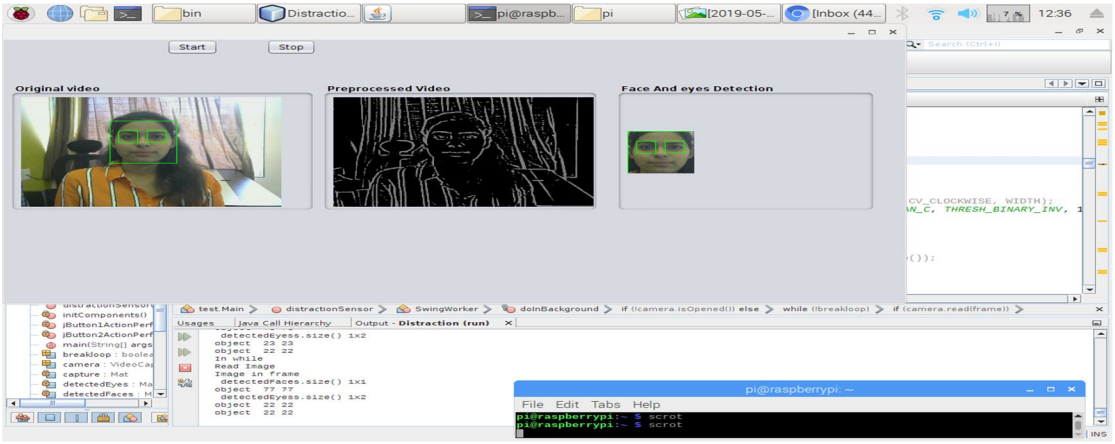

Figure 4: Eye Detection

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When driver is feeling sleepy in that case the eyes are closed and mouth is open again an alert sound is given with message DRIVER IS DROWSY" on LCD screen.

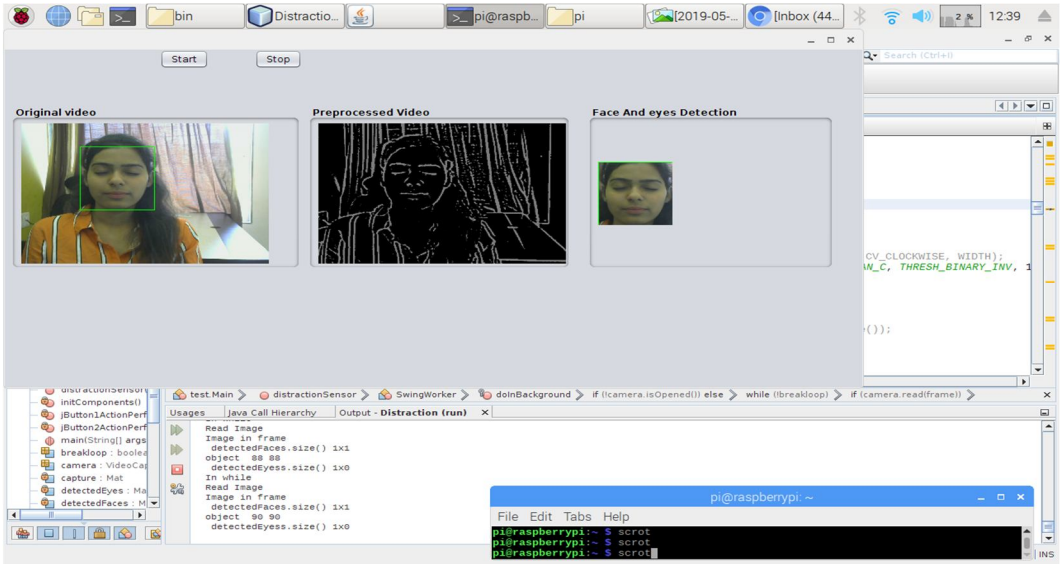

Figure 5: Drowsiness Detection

VI. CONCLUSION

We develop a system, which Helps drivers in driving car effectively. Also increases passenger safety and give the information about the driver's behavior while driving and detect 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 driver.

The system could warn the driver to pay attention whenever the driver's gaze gets distracted on a position other than the road. The Haar cascade algorithm used to detect Face, eye and yawning very efficiently as compared to the Viola-Jones algorithm which only detects frontal faces. Haar cascade has high performance as compared to viola Jones performance i.e. viola Jones performance cannot easily be estimated. Haar cascade has a good solution as compared Adaboost algorithm is a suboptimal solution. In future the warning mechanism will be given in the form of visual, audio or some kind of positive feedback can be incorporated that can influence driving behavior in a positive manner.

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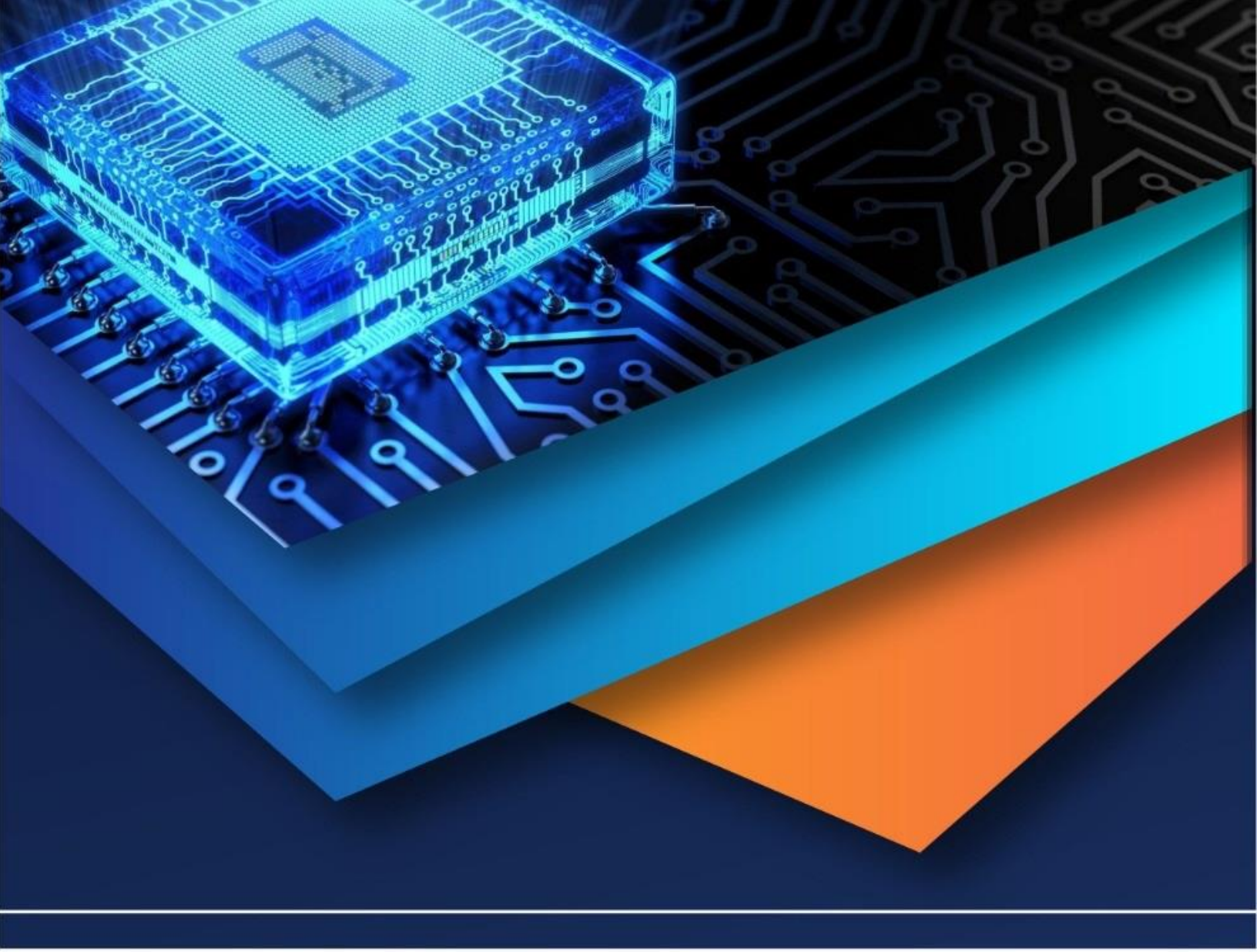

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