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Sleeping Driver Detection along with Safety Measures

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Abstract— Our main motive is to make a project based on a system that will help driver to stay alert on the road as well as drive or handle the vehicle only in the conscious state i.e. will be able to driver only when the person is non alcoholic and when the person is wearing seat belt along with the security feature with the use of Radio Frequency Identification(RFID).
Keywords: Alcohol sensor, Buzzer, Arduino, RFID, IR sensor.

I. INTRODUCTION

Every year thousands of people lose their lives due to traffic accidents around the world. Unfortunately Iran ranks first in the world in terms of road fatalities and each year approximately thirty thousands of fellow countrymen lose their lives in these events. The role of human factor in accidents cannot be ruled out. In general, the driver fatigue accounts for 25 percent of accidents and approximately 60 percent of road accidents result in death or serious injury. In a study by the National Transportation Research Institute (NTSRB) in which 107 random car accidents had been selected, fatigue accounted for 58% of the all accidents. A main cause of fatigue is sleeplessness or insomnia. Drivers' drowsiness is a major contributing factor in severe road accidents that claims thousands of lives every year. According to accident statistics presented by Oklahoma Transportation Institute, which showed 22 percent of all accidents were due to driver's drowsiness and fatigue, Bittner at al. (2000) proposed an electronic system to alarm drivers. In recent years many models have been proposed to keep the driver alert & awake while driving on the road but what they lacks is the precision in their models . Driver fatigue is a factor which non-negotiable so we have to make systems to deal with it. There are various other reasons for the accidents like the alcohol consumption so if the driver is alcoholic and driving then the case of drunk and drive is very harmful for both driver as well as for the other people a system is needed so that if the driver is alcoholic then the car will not start. There are other cases in which the driver is not wearing seat belt this case is also a serious case so a system is there to notify driver to wear seat belt. Along with this feature there is one more feature which makes the use of RFID to prevent the car from theft.

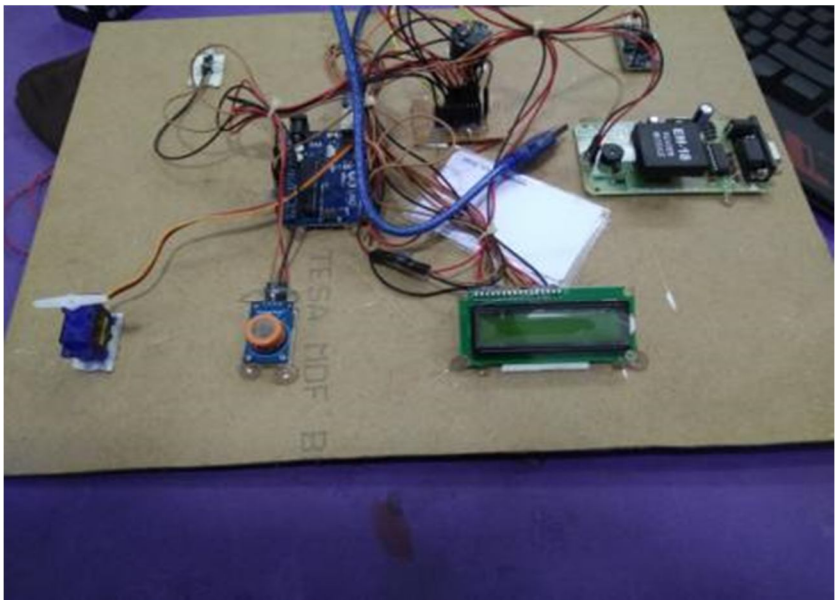


Fig. 1 Diagram of entire project circuit

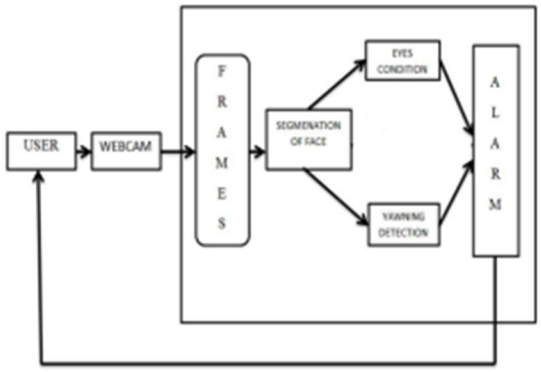
II. LTERATURE SURVEY

Title of the Research Papers	Year of Publication	Authors	Method Proposed
Face detection using combination of skin color pixel detection and viola-jones face detector	2014	Guan-chun Luh	Viola-Jones algorithm
A new system for driver drowsiness and distraction method	2013	Zoorofi, Sabbaghian, R.A	Haar-like features and AdaBoost classifiers
Real-Time Intelligent Alarm System of Driver Fatigue Based on Video Sequences	2013	Khosro Rezaee, S. Reza Alavi,	K-means Clustering,

III. PROPOSED SYSTEM

In this model, the person's face is filmed by a camera in the first step by receiving video sequence. Now, in the received frame from captured image we use detection of face eyes and mouth and apply behavioral measures such as eye closure and yawning to detect drowsiness of the driver.Alcohol detection sensors to sense for alcohol consumption.Seat belt alarm that will alarm the driver for the belt through the use of IR sensor and RFID for for the car locking and opening system through unique id.

A. Architecture Diagram



B. Data Flow Diagram

IV. MODULES

A. Segmentation of Face

The face is segmented from the input image that is initially whatever the video that is recorded by the camera will be fragmented into the frames and this frame will be given as inputs for segmenting the face.

B. Detection of Eyes Condition

The position of the driver's eye is determined by using appropriate threshold. In this work, edge detection of the eyes region is considered.

C. Seat belt Detection

The seat belt position is analysed through the use of IR sensor and the buzzer will blow if the seat belt is not applied.

D. Alcohol Detection

In this feature if the driver is drunk then the car will not start .This is implemented through the use of alcohol sensor.

E. Use of RFID

This module focuses on the use of RFID for providing unique identification to the car.

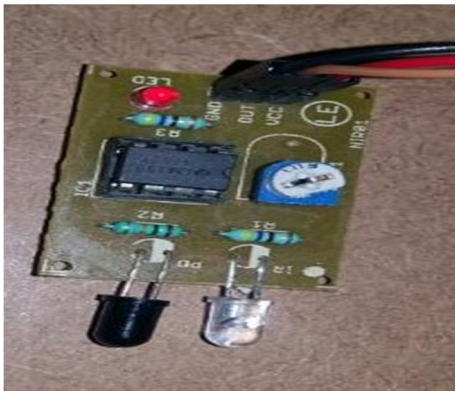
V. COMPONENTS USED

A. Alcohol Sensor

This alcohol sensor is suitable for detecting alcohol concentration on your breath, just like your common breathalyzer. It has a high sensitivity and fast response time. Sensor provides an analog resistive output based on alcohol concentration.

B. IR Sensor

An infrared sensor is an electronic instrument which is used to sense certain characteristics of its surroundings by either emitting and/or detecting infrared radiation. Infrared sensors are also capable of measuring the heat being emitted by an object and detecting motion. Here it is used to detect the status of seat belt .In this it contains two LED from which one is used for emitting and another one is used for receiving.

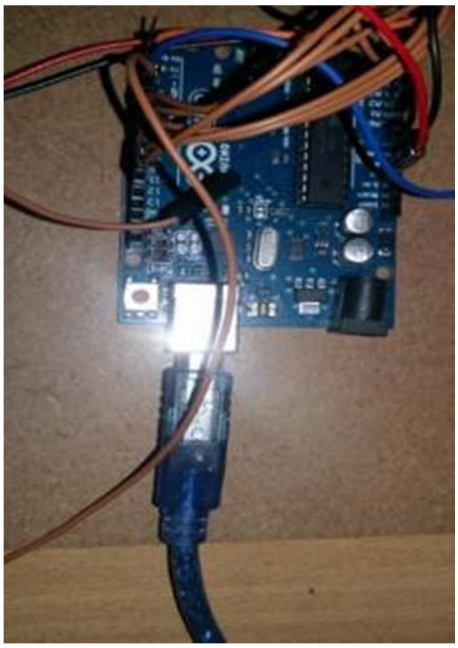


C. LCD Arduino Compatible

LCD is used in the circuit so that the result could be seen on the screen of the LCD . In LCD there are 14 pins which are having their own use.

D. Arduino

Arduino is an open source, computer hardware and software company, project, and user community that designs and manufactures microcontroller kits for building digital devices and interactive objects that can sense and control objects in the physical world.



E. RFID

RFID (radio frequency identification) is a technology that incorporates the use of electromagnetic or electrostatic coupling in the radio frequency (RF) portion of the electromagnetic spectrum to uniquely identify an object or person. It uses electromagnetic fields to automatically identify and track tags attached to objects. The tags contain electronically stored information. Passive tags collect energy from a nearby RFID reader's interrogating radio waves.

F. Buzzer

An electrical device that makes a buzzing noise and is used for signalling. Here it is used to alert the driver if the driver is found sleepy.

VI. MTHODOLOGY AND IMPLIMENTATION

A. Viola Jones Algorithm

1) A widely used method for real-time object detection.
2) Rectangle_Feature_value f :
3) f= ∑(pixels in white area) – ∑ (pixels in shaded area)
4) If (f) is large, then it is face:
5) if (f)>threshold, then
6) face
7) Else non-face

B. Here the Proposed System Includes Following Parts

1) *Segmentation of Face:* This is the very first module in which the face is segmented from the input image that is initially whatever the video that is recorded by the camera will be fragmented into the frames and then into the image, this image will be given as input for segmenting the face. Here we have to detect the face region out of the whole image. Face is our region of

interest i.e, the foreground object and rest is the background image. Face detection is done through Viola Jones algorithm

2) *Detection of Eyes and its Condition:* Important factor which helps detect driver fatigue is the state of eyes, i.e. whether they are open or closed. We are locating the position of the eye in the frame taken from the drivers face. In the state of fatigue, eyelid muscles subconsciously attempt to accelerate the process of going to sleep. Using this property, determining whether eyes are open or closed is done by relying on the difference of brightness intensity of the pupil in the image. Here, in this part

a) Eyes are detected.

b) Eyes are segmented from the face.

c) Edge detection is done to detect the edges of the eyes.

Find the gradient of the pixel. The gradient is a vector, whose components measure how rapid pixel value are changing with distance in the x and y direction

$$\Delta x = \frac{f(x+dx,y)-f(x,y)}{dx}$$

$$\Delta y = \frac{f(x,y+dy)-f(x,y)}{dy}$$

VII. TESTING CASES

Test case ID	Test Case	Input	Expected output	Obtained Output	Result
TID1	Detecting face	Input Frame	Face detected	Segmentation of face	Pass
TID2	Detecting eyes	Segmentation of face	Eyes detected	Edges of the eyes	Pass
TID3	Detection of mouth	Closed eyes	Detected mouth	Clustered mouth with large hole	Pass
TID4	Driver's fatigue condition	Eyes open and Mouth closed	Non Fatigue	No Alarm	Pass
TID5	Driver's fatigue condition	Eyes closed and Mouth closed	Fatigue	Alarm generated	Pass
TID6	Driver's fatigue condition	Eyes closed and Mouth opened	Fatigue	Alarm Generated	Pass
TID7	Driver's fatigue condition	Eyes opened and Mouth opened	Fatigue	Alarm Generated	Pass

VIII. APPLICATIONS

A. Prevents the driver from falling asleep in long and solo trip.

B. System can also be used in other situation such as operators at nuclear plants , pilots of airplanes , security guard

C. Used to ensure safety of driver by giving reminder of seat belt.

D. Will be used to ensure no drunk and driver.

IX. CONCLUSION

A non-invasive system to localize the eyes and monitor fatigue was developed.

During the monitoring, the system is able to decide if the eyes are opened or closed or if mouth is opened or closed. When he eyes have been closed for too long or mouth is closed a warning signal is issued.

A. The Following Conclusions were made

1) Image processing achieves highly accurate and reliable detection of drowsiness.

2) Image processing offers a non-invasive approach to detecting drowsiness without the annoyance and interference

3) A drowsiness detection system developed around the principle of image processing judge the driver's alertness level on the basis of continuous eye closures.

X. LIMITATIONS

A. System can't be used in night.

B. Accuracy compromised in low light conditions.

XI. FUTURE ENHANCEMENT

A. Efficiency can be improved by using infra-red camera in low light conditions

B. System can be integrated with GPS to automatically stop processing when vehicle is not in motion.

C. System in nearby proximity can interact to send signals to other driver in case any driver is in drowsy mode.

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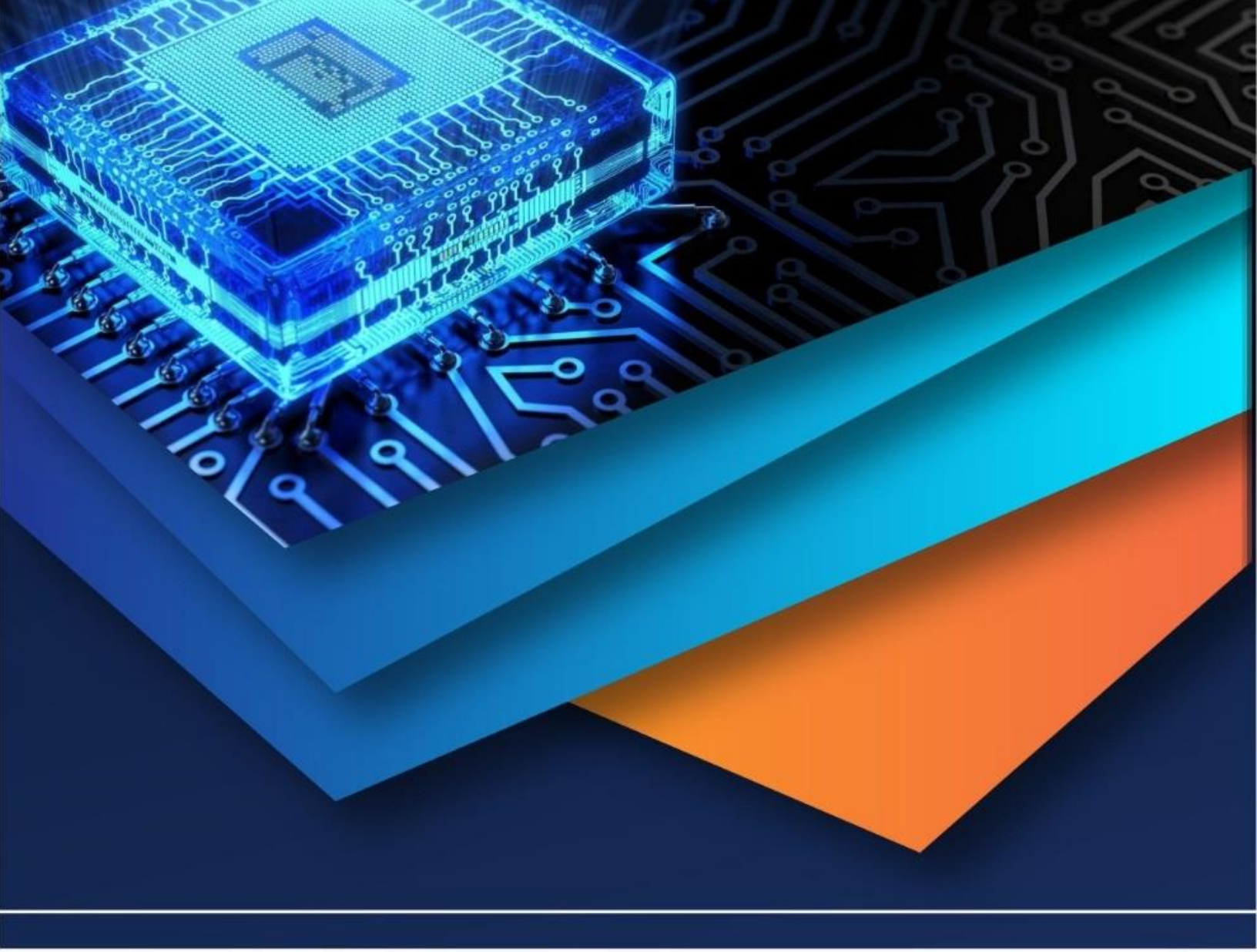

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