Review Paper on Real Time Application of Embedded System for Driver Safety by Using Raspberry Pi

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ABSTRACT

This project gives approach for real time detection of car driver drowsiness and alcoholic intoxication. There are various reasons behind the increasing number of vehicle accidents which are becoming a very serious issue but the ones that can be prevented are the mental and physical condition of the driver while driving and frequent monitoring of it can be achieved with the help of technology. In this project, we have developed an automatic system with will perform some task like issuing the alarm notification and switching off the car power source to stop the car upon receiving the positive detection message from Raspberry-pi.

Keywords: Raspberry Pi, Embedded System, Haar Cascade Classifier

1 Introduction

In this era of high speed communication, life has become very fast and the world prefers speedy means for communication. Some surveys suggest that there are several cases of road accidents happening all over the world [1]. Out of the several accident cases, most of the accidents and miseries are occurring due to drowsiness and alcoholism [2, 3]. The design is based on computer vision and embedded system. Driver drowsiness and alcohol drinking is severe problem which results in thousands of road accidents per year. It is difficult to correctly tell the exact number of sleep and alcohol drinking related accidents but traffic survey shows that driver drowsiness may be contributory factor in up to 20% and due to alcohol drinking is up to 33% of all road accidents.

The goal of this project is to create one more step towards solving this serious problem. The project represents new design to detect drowsiness and alcohol intake of car driver and perform necessary action on real time. For the detection of drowsiness eye closing time of the driver is measured. Haar transform is used for face detection and to detect the alcoholic intoxication of driver an alcohol gas sensor method is used which works as a breathalyzer and calculates blood alcohol content (BAC) from breath air content (BrAC). Here Raspberry-pi board is used to speed up the process. A digital camera is used which is capable to capturing real images. The capturing real time images of the eye, gets compared with the eye images in the database. If eye remains closed beyond threshold value, then Raspberry-pi sends a warning data to the micro controller over I2C serial bus.

Alcohol sensor is continuously checks alcohol content present in the air and computes blood alcohol content from it. . If the calculated blood alcohol content is crosses the threshold value then Raspberry-pi sends a warning data to the micro controller over I2C serial bus. On receiving warning massage, controller performs a set of tasks like issuing buzzer notification or turning off a relay to stop a car.

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2 System Architecture

Detection of drowsiness can be done in several ways like remotely measuring the heart rate or facial expression of person to be tested. This work is combination of face detection, eye region detection and alcohol detection in real time environment.

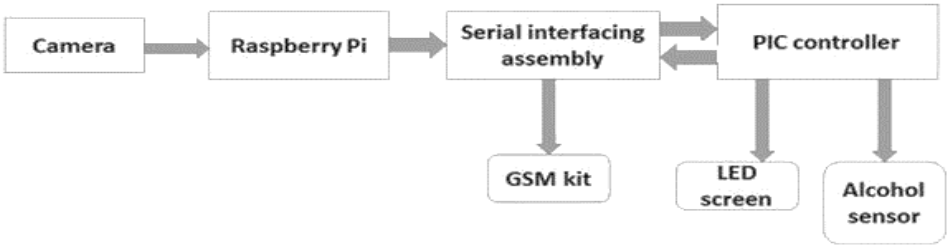

Figure 1: *System block diagram*

3 Camera

In this project, the camera system is connected to the raspberry pi board through which we can monitor the driver's movements. The footage captured through the camera is processed through Open CV and python script and the information is processed through image processing. The contextual criteria are determined.

For this, you have used a camera with a cumulative model, the capacity is 2 megapixels, through which you get the desired image quality.

4 Raspberry pi

To develop this project, we have used Raspberry Pi 3 b model, it has a 1 GHz quad core processor, 1 GB of RAM, which speeds up the processing, and has 40 types of input and output pins. It is possible to exchange information with the devices connected for communication. This board is based on newly developed technology, its user interface is very simple and you can connect the GSM kit with the serial interface to this board. A system has been developed to send messages to the owner as well as the driver's mobile

Raspberry Pi has the ability to connect to the Internet on its own, so you can connect the system to the Internet to exchange information about the rocket, as well as connect the board with many other controllers.

5 Serial interfacing Assembly

With this we have developed communication methods with Raspberry Pi and Serial Communication Devices. we have connected the processed data from Raspberry Pi to the car owner's mobile via GSM Kit, a serial interfacing assembly. When attaching this kit you have used RS 232 connector through which the processed information is transmitted to the GSM kit through serial communication and the information will be transmitted from the GSM kit.

6 GSM Kit

The SIM900A is a readily available GSM/GPRS module, used in many mobile phones and PDA. The module can also be used for developing IOT (Internet of Things) and Embedded Applications. SIM900A is a dual-band GSM/GPRS engine that works on frequencies EGSM 900MHz and DCS 1800MHz. SIM900A features GPRS multi-slot class 10/ class 8 (optional) and supports the GPRS coding schemes CS-1, CS-2, CS-3 and CS-4.

7 PIC board implementation

The assembly consists of LCD and PIC microcontroller soldered on it along with crystal oscillator. MAX 232 board was connected to pin Rx and Tx of PIC. MQ-4 sensor module board was connected to pin PA0 of PIC. LED is connected to pin PC0 via 220 Ohm resistor. Power supply of 5V was developed to provide supply to PIC and MAX232 and MQ-4 sensor board.

8 Face detection result:

The image was captured using the camera interfaced to the raspberry pi. This image was processed using python based program to detect face in the image. Figure 2 shows the result of face detection using raspberry pi.

Figure 2: *Face detection on raspberry pi*

9 Eye region detection using a raspberry pi

Haar cascade eye.xml was used in open cv based python program. Camera captured image is processed to detect eyes. Figure 3 shows the eye detected.

Figure 3: *Eye detection using raspberry pi*

10 Cropped eye region

Figure 4: *Cropped eye region in open eyes state*

After detecting eyes in the image, eye region is cropped to calculate gray threshold and based on this value whether eyes closed or open i.e blink detection is done. Figure 4 shows the open eyes state.

11 Standardization of drowsiness detection

Experimentation also involves the situation created when person is feeling more sleepy after heavy lunch

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or dinner conditions. Along with these conditions, when driver was continuously on dispatch duty, dispatch process constitutes the involvement of 2-3 drivers. The tired conditions of these drivers are also taken into consideration while experimentation.

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