Driver Drowsiness Detection System using Raspberry Pi

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Abstract- The reason for accidents on roads include driver's reckless behavior, drunken drive, and drowsiness. Drowsiness of the driver is the main reason for the major accidents. So in the proposed system a non-intrusive drowsiness of the driver monitoring system has been developed using computer vision techniques and Raspberry Pi. The system will be able to detect the drowsiness inspite of darkness and driver wearing spectacles. In addition to the drowsiness detection, the engine of the particular vehicle will be stopped once detected and give a buzzer to alert the driver.

Keywords- Raspberry Pi, Camera Module, Open CV HARR classifier technique, motor, buzzer.

I. INTRODUCTION

Drowsy driving is the major problem in many states. The tragic results of drowsy driving are alarming. A research estimated every 25 drivers have fallen asleep while driving. Drowsiness while driving was the only reason for 72,000 crashes, 44,000 injuries and also deaths. The developing of technologies for detecting or preventing drowsiness, is the major challenge in the field of accident avoiding system.

The main aim of the project is to develop a detection system that will accurately monitor the eye blink rate, movement of the head etc. The values measured will be sent to the Raspberry Pi where the measured values are compared with the referred values. If there is no match then, the system will send a warning signal through buzzer to the driver and stops the engine thereby preventing accidents

II. DROWSINESS ALERT UNIT

The following proposed system is a small system so that it can be easily embedded or fixed on any vehicle. The camera module is fixed near the driver, which helps to capture the movement of eyes and the position of the face, the output is connected to the Alarm or Buzzer that alerts the driver and once it is detected, the engine is immediately stopped.

The proposed system is developed by interfacing the eye blinks and face position of the driver. The following system comprises of three phases. They are:

1. CAPTURING
2. DETECTION
3. ALERTING

CAPTURING: The camera module that is embedded near the driver captures the eye blinking and face movement of the driver.

DETECTION: The captured image is detected on basis of the eye open/closed state and the moving position of the face of the driver. The driver's present driving behavior is detected using the HARR classifier that is inbuilt in OpenCV.

ALERTING: Once the driver's drowsiness is detected the raspberry Pi alerts the driver with the buzzer and once the drowsiness of the driver is detected the engine is stopped automatically to save the driver.

III. FLOWCHART

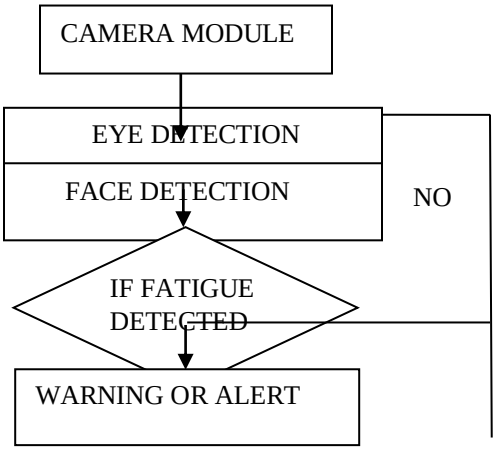

Fig.1: Flowchart of proposed system

IV. DESCRIPTION

A. RASPBERRY Pi: Its cost is very low, credit card sized computer that is inserted into a computer or a T.V, and uses components like mouse, keyboard, internet module etc. It has the capability to interact with the outside world, and has been used in wide range of digital projects maker.

It has 5 models. They are:

- MODEL A: It consists of one USB port and no internet connection with a storage of 256Mb RAM.
- MODEL A+:
  It consists of one USB port and with network connection with a storage of 256 Mb RAM.
- MODEL B:
  It consists of 2 USB ports and also an Ethernet port with storage of 512Mb RAM.
- MODEL B+ :

It consists of 4 USB ports, 1 Ethernet port, HDMI and camera interface slot and 512 Mb RAM.

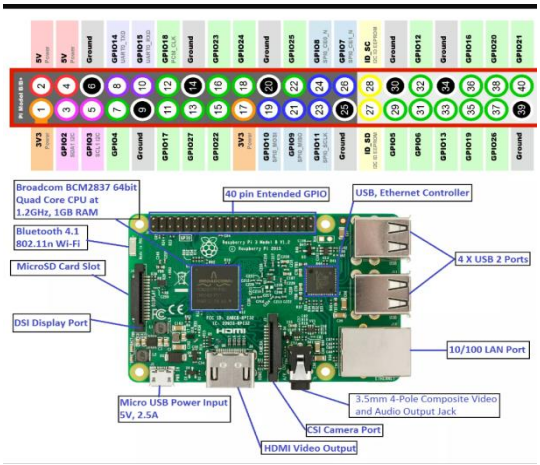

Fig.2: Raspberry pi pin configuration

B. Open CV:

It is also known as Open Source Computer Vision. It is a library of functioning programs that are aimed mainly at real-time computer vision. It is used to advance the CPU applications, part of series of projects involving real-time ray tracking and displaying 3D wall also.

Its features are:

- 2D and 3D features tool kit.
- Facial recognition system.
- Motion understanding.
- Advance vision research by providing not only open but also optimized code for basic infrastructure.

This usually has 2500 optimized algorithms, which includes classic and state of art computer vision and algorithms of machine learning.

C. CAMERA MODULE:

It is a sensor that is used for taking images or pictures. It is integrated with lens, control electronics. The image when captured by the Raspberry Pi is saved and then detected by the processor. In this proposed system the role of camera module is very essential as it captures the driver's image and detect the drowsiness.

Fig.3: Camera module

D. BUZZER:

Fig.4: Buzzer

Buzzer is also known as deeper is a signaling device using audio. This signal may be mechanical and electro-mechanical. The typical uses of the beepers or the buzzers includes alarm devices, timers and also confirming of the users input like a key stroke or a mouse click

E. CIRCUIT DIAGRAM

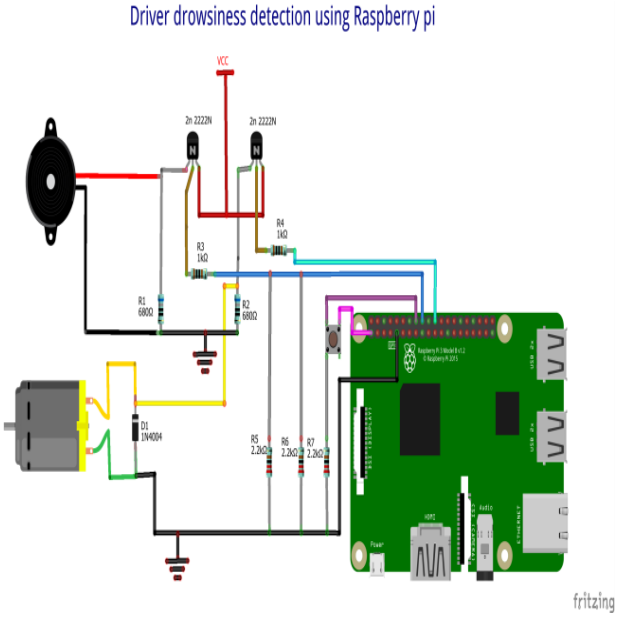

Fig.5: Circuit Diagram

V. PROCEDURE

- In the proposed system the main focus is to detection of driver's drowsiness as fast as possible.
- So here in our project the connections are made such that the alert to the driver is given as soon as the drowsiness is detected.
- The camera module is connected to the Raspberry Pi,
- This helps in capturing the images of the driver.
- Once the images are captured they are sent to the process of detection.
- The HARR classifier and the open CV that are installed earlier in the raspberry Pi helps to detect the drowsiness of the driver .The HARR classifier cascade files inbuilt on Open CV which includes different types of classifiers for face and eye detection.

- The system would detect in spite of wearing spectacles, colour of the driver, and darkness around the driver.
- They detect the eye blink and driver's face position.
- The eye blink and the face position of the driver are the main parameters through which the driver's drowsiness is detected.
- Initially the limit for the frames in which the eye can be closed is saved.
- If the limit of frames exceed the threshold limit then the drowsiness is detected and the alert is given in the form of buzzer.
- Once the alert is given in the form of buzzer the motor that indicates the engine of the particular vehicle stops.
- Thus avoiding the occurrence of any accidents due to abnormal behavior of the driver.
- In order to start the engine again we have to restart by pressing the start button.

VI. PERFORMANCE & LIMITATIONS

- **DEPENDANCE ON LIGHT:**
  The developed model depends strongly on light conditions. Our algorithm considers the eye sight as dark region when it is closed whereas bright region when it is opened. So if there is ambient condition affect it may lead to an error in the result. In order to overcome this problem we can switch on the LED lights that are present on the camera module that we are using.

- **USE OF SPECTACLES:**
  If the user is wearing spectacles then it would be difficult to detect because the reflection of the spectacles due to light may give the result for closed eye as open eye.

- **DISTANCE OF CAMERA FROM THE DRIVER:**
  For an effective result the distance from the camera and the driver should be 100m.But it varies for the other vehicles as every vehicle do not have the Same seat lengths.

VII. RESULTS

The system that is proposed detects the driver's drowsiness when the eyes are closed for a certain period of time. As the system is small in size it can be embedded in any vehicle. This system helps in detecting the normal state of the driver during his/her eyes are open, whereas when his/her eyes are closed for continuous 4 frames the drowsiness is detected, and the alert is given to correct the driver's abnormal behavior and thus engine stops.

VIII. CONCLUSION

In the proposed paper, we have reviewed various methods to detect the drowsy state of the driver. This system is used to avoid accidents that are caused by drowsy driving and also give caution to the driver by alarm. The system can be developed further by using different sensors and road detection cameras with proper hardware units and controller, which can provide accurate detection techniques. This system can be used in vehicles now –a-days as it is of a very few cost and embedded easily, which help in reducing the rate of accidents in our country

IX. REFERENCES

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