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# Black Box for Accident Analysis Using MATLAB-Image Processing

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**Abstract**: The main purpose of this paper is to develop a prototype device that can be installed in automobile for accident analysis .in this paper I proposed a method to analysis the face of driver that weather he was felling doziness while driving. This is done by taking the image from the raspberry pi device and put it in an image processing method using MATLAB. Also, I used the method to store the data into the cloud as well as device which can be further used for analysis the cause of accident.

**Keywords**: *raspberry pi, MATLAB, Controller*

## 1. INTRODUCTION

According to [1]WHO report says that there are millions of people die every year because of vehicle accident. In order to solve the causes of accident this black box plays a crucial role to know the purpose of accident and this black box records data and images which is later used for forensics in case of car accident it stores clips that is used for investigating automobile related accidents. This system approaches in three ways first is that how to detect and record the data in vehicle. [1][2][4]Second is how to store the data recorded in the black box. Third is how to analyses the images stored in black box using MATLAB. As implementing first method some important electronic components and different types of sensors were used and second method we used cloud to store the data so that we can later fetch the data from cloud even if the device completely damaged and the third method we take the image from black box manually and load into the MATLAB program and analyses the image weather the driver was active or inactive during driving So, the proposed system show the consciousness of the driver in nonreal-time processing using MATLAB simulation of the image fetched from the black box device.

## 2. OVERVIEW OF THE SYSTEM

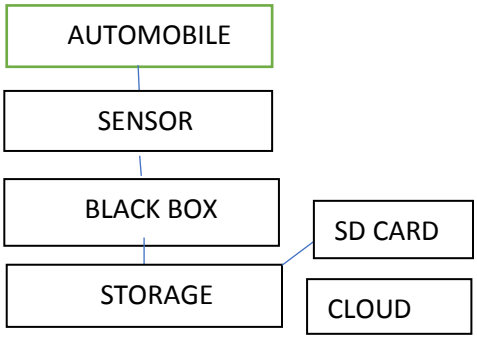


Figure 1 system flow chart

## 3. OVERVIEW OF THE PROPOSED SYSTEM

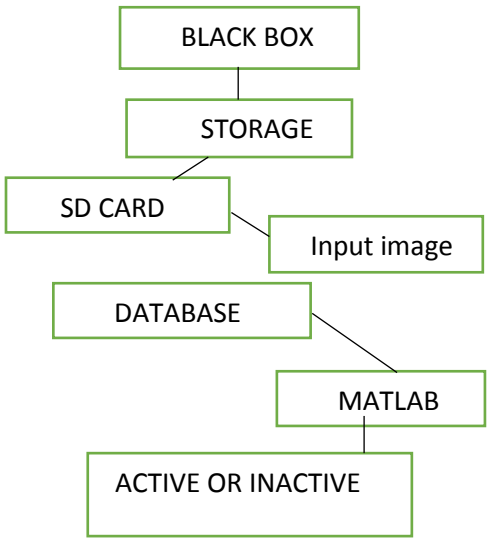


Figure 2 Proposed system flow chart

### Sensors: -

Ultrasonic: - An Ultrasonic sensor is a device that can measure the distance to an object by using sound waves. It measures distance by sending out a sound wave at a specific frequency and listening for that sound wave to bounce back. By recording the elapsed time between the sound wave being generated and the sound wave bouncing back, it is possible to calculate the distance between the sonar sensor and the object. Since it is known that sound travels through air at about 344 m/s (1129 ft/s), you can take the time for the sound wave to return and multiply it by 344 meters (or 1129 feet) to find the total round-trip distance of the sound wave. Round-trip means that the sound wave traveled 2 times the distance to the object

before it was detected by the sensor; it includes the 'trip' from the sonar sensor to the object AND the 'trip' from the object to the Ultrasonic sensor.

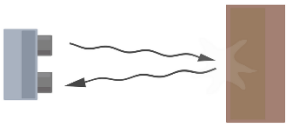

Figure 3 Ultrasonic waves

Fire sensor: -
fire sensor circuit exploits the temperature sensing property of an ordinary signal diode IN 34 to detect heat from fire. At the moment, it senses heat, a loud alarm simulating that of Fire brigade will be produced. The circuit is too sensitive and can detect a rise in temperature of 10 degree or more in its vicinity. Ordinary signal diodes like IN 34 and OA 71 exhibits this property and the internal resistance of these devices will decrease when temperature rises.

IR Sensor: -
IR Sensors work by using a specific light sensor to detect a select light wavelength in the Infra-Red (IR) spectrum. By using an LED which produces light at the same wavelength as what the sensor is looking for, you can look at the intensity of the received light. When an object is close to the sensor, the light from the LED bounces off the object and into the light sensor. This results in a large jump in the intensity, which we already know can be detected using a threshold.

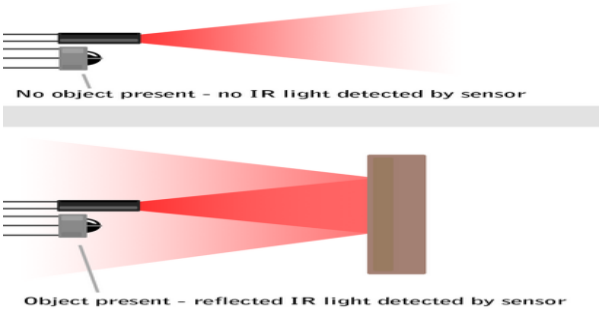


Figure 4 Detecting object through infrared

## Detecting Brightness

Since the sensor works by looking for reflected light, it is possible to have a sensor that can return the value of the reflected light. This type of sensor can then be used to measure how "bright" the object is. This is useful for tasks like line tracking.

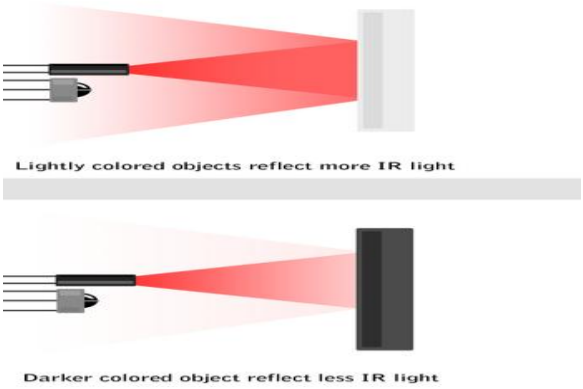


Figure 5 Different object identified by IR Sensor

Alcohol Gas Sensor: -
Gas Sensor(MQ2) module is useful for gas leakage detection (home and industry). It is suitable for detecting H2, LPG, CH4, CO, Alcohol, Smoke or Propane. Due to its high sensitivity and fast response time, measurement can be taken as soon as possible. The sensitivity of the sensor can be adjusted by potentiometer 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. The drive circuit is very simple, all it needs is one resistor. A simple interface could be a 0-3.3V ADC.

LDR Sensor: -
A **Light Dependent Resistor** (LDR) or a photo resistor is a device whose resistivity is a function of the incident electromagnetic radiation. Hence, they are light sensitive devices. They are also called as photo conductors, photo conductive cells or simply photocells. They are made up of semiconductor materials having high resistance. There are many different symbols used to indicate a **LDR**.

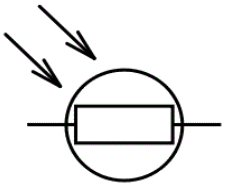

Figure 6 LDR

**IMAGE PROCESSING USING MATLAB: -**
Image Processing Toolbox provides a comprehensive set of reference-standard algorithms and workflow apps for image processing, analysis, visualization, and algorithm development. You can perform image segmentation, image enhancement, noise reduction, geometric transformations, image registration, and 3D image processing.

Image Processing Toolbox apps let you automate common image processing workflows. You can interactively segment image data, compare image registration techniques, and batch-process large data sets. Visualization functions and apps let you explore images, 3D volumes, and videos; adjust contrast; create histograms; and manipulate regions of interest (ROIs).

In this prototype image is being fetched from the black box manually, then it is being analyzed in the MATLAB using fuzzy logic method. From this process, we get a result weather the driver was drowsy or not while driving the car.

## 4. METHODOLOGY ADOPTED

[5]A Raspberry pi is a credit card-sized computer originally designed for education, inspired by the 1981 BBC Micro. It is a low-cost device that would improve programming skills and hardware understanding at the pre-university level. But thanks to its small size and accessible price, it was quickly adopted university level. But thanks to its small size and accessible price, it was quickly adopted by tinkerers, makers, and electronics enthusiasts for projects that require more than a basic microcontroller. The Raspberry Pi is slower than a modern laptop or desktop but is still a complete Linux computer and can provide all the expected abilities that implies, at a low-power consumption level.

Python language is used for programming the Raspberry Pi. Threading is being used in python programming to run image and Data Recording.

## 5. EXPERIMENTAL RESULTS

The different sensors interface to the system is shown in Figure

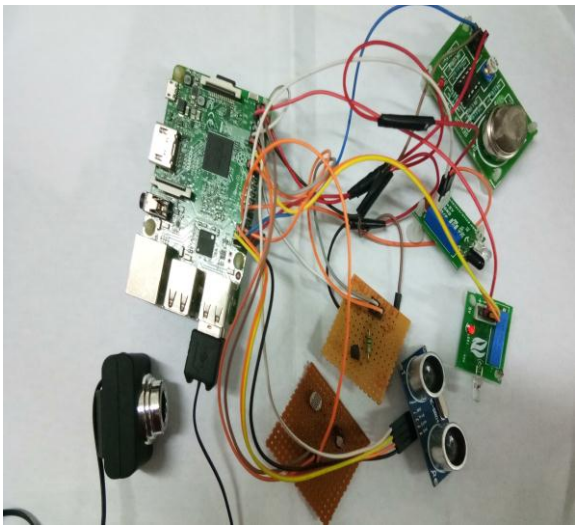

Figure7Model of Different Sensors attached to raspberry pi.

Image processing is shown in figure 8

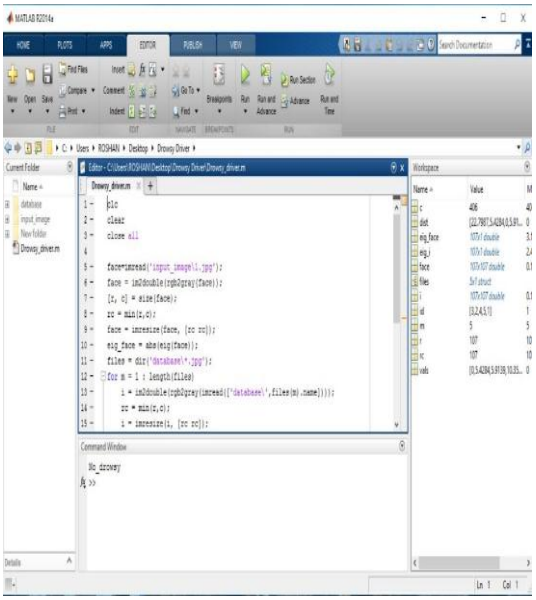

Figure8 Fuzzy Algorithm used to detect Drowsy

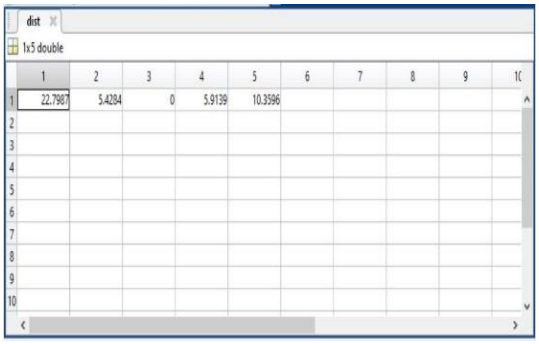


Figure 9 Distinct Value of no drowsy in MATLAB

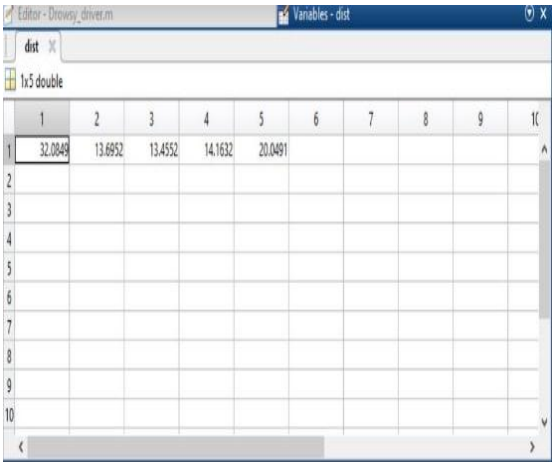


Figure 10 Distinct value of drowsy in MATLAB

The values from Raspberry Pi are transferred over to the cloud over Wi-Fi. The Raspberry Pi output is shown in Figure11

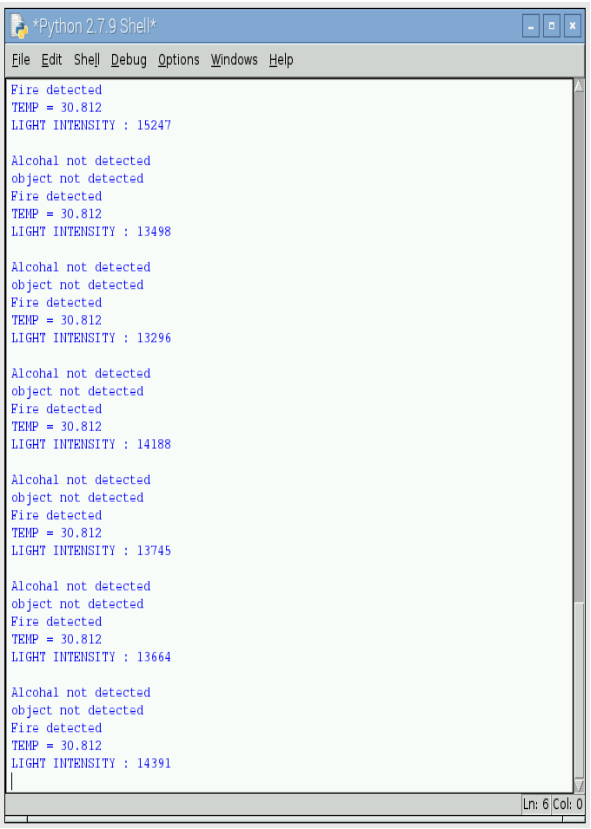


Figure 11 Values of different sensors

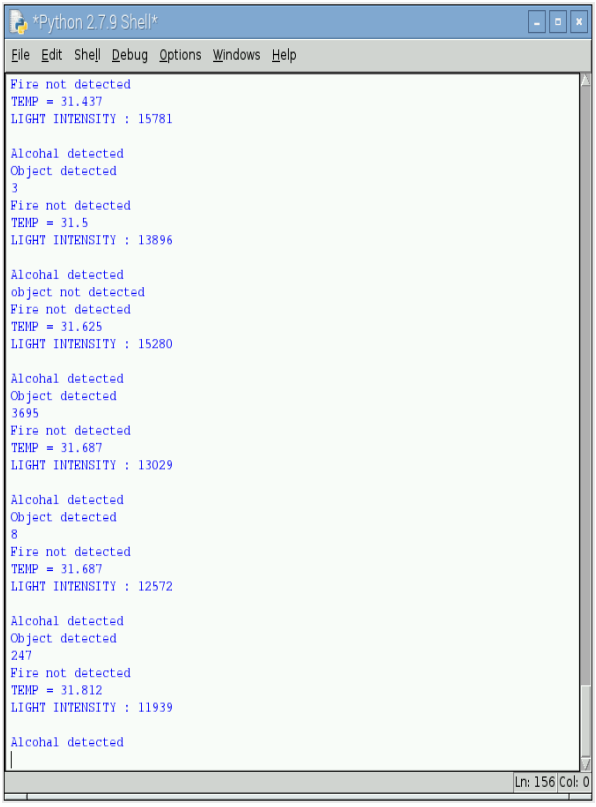


Figure 12 Values of different sensors

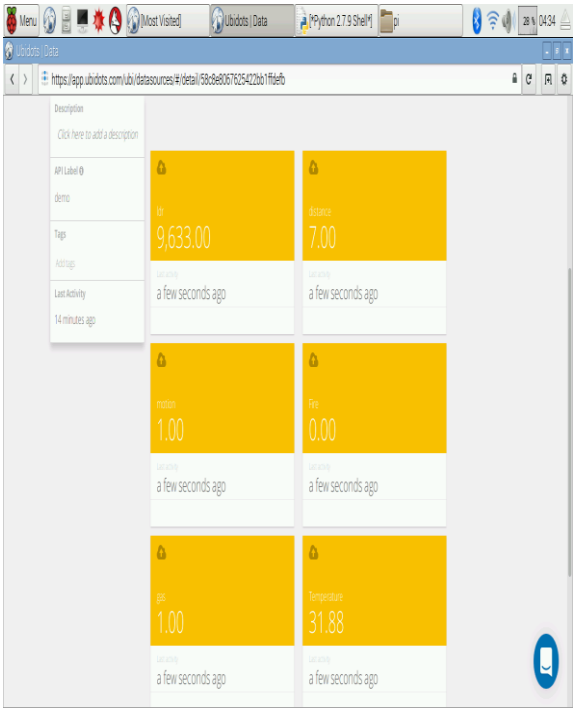


Figure 13 Values being stored over the cloud

## 6. CONCLUSION

This paper has presented a vision for the vehicles, which is the Black Box system used for automobiles. A description was made for every part of this system. This paper has also offered a user-friendly MATLAB program to analyze the image of the accident. The Black Box system built can be implemented in any vehicle. As soon as the driver runs the motor, this system will start recording the events of the vehicle. The data saved can be, retrieved before and after the accident for analyses purposes. Data can also be retrieved in the form of .txt format from the board in case of data uploading failure over cloud.

## 7. FUTURE SCOPE

System can further improve by connectivity of connection between black box over to the cloud even when vehicle is not on mechanically and electrically. Also, to improve the accuracy of driver drowsiness while analyzing the image. The system can be made more rigid device in case of crash.

## 8. REFERENCES

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