Vehicle Black Box System Using IoT

Aiswarya S[1], Charles G[2], Deenadayalan R[3], Deepika J[4], Girisha D[5]

[1]Assistant Professor, [2,3,4,5]UG Students **-** Final Year, Department of Electronics and Communication Engineering, Velalar College of Engineering and Technology, Erode - 638012, Tamilnadu, India

Abstract

Millions of people die due to theaccidents. The main purpose of this paper is to provide vehicle safety and a solution that automatically alert the driver to be cautious. In this paper we continuously monitor the vehicle performance using sensors and the behavior of driver with the use of IoT Technology. The Vehicle black box receives the information from various sensors like the breath analyzer, acceleration and the distance of surrounding vehicles along with push and panic button. When the driver alcohol consumption reaches maximum limit, the messages are sent to emergency contacts. If the accident occurs, by using GSM and GPS the vehicle location is traced and the information is sent to local hospital and police. With the IoT Technology, this location is always traced in the cloud platform service. The push and panic button is used to alert the 24/7 Governance to call out for emergency help.

Keywords: Vehicle Black Box System (VBBS), Internet of Things (IoT), Global Positioning System (GPS), Global System for Mobile (GSM).

1. Introduction

IoT is an emerging technology in the field of communication. IoT devices are connected to the internet, through various wireless communication protocols. These devices are served Machine to Machine. With the developing IoT Technology, the devices are made to work in real time environment such as Home automation, Smart grids etc. To develop the huge platform the potential business is neededfor the growth and improvement of the technology. According to the World Health Organization, million numbers of people are dying everyday due to accidents [1]. To solve the problem in many countries, where solution is being a raised with the help of vehicle Black Box. Despite of several campaigns the problem is still increasing day by day, such cases are drunk and drive, speed driving and insufficient sleep. Due to the constant work in recent times the automation must improve using IoT. This article will provide the visual data, and the cloud monitors it with the help of low power microcontroller. The article of this paper maintains two rules, first rule is to visualize data by detecting the sensors and the second is to present the data to the end users by simple method. The automation industry mainly levels the technology in the vehicles through high range with low power [2]. Vehicle black box updates the data recording position tracking and the collision data always when the vehicle is in the active mode.

So, in this way the crash collisions of the vehicles can be easily identified which is possible to help the victims from the governments or hospitals. In India, according to Indian express the country recorded at least 4,80,652 accidents in 2016, leading to 1,50,785 deaths. The number suggests that at least 413 people died every day in 1,317 road accidents. Further breaking down the statistics, the data reveals that at least 17 deaths occurred in road accidents in 55 accidents every hour in the given time.

2. Literature Review

Amin A, Md Syedul, Jubayer Jalil, and Mamun Bin Ibne Reaz. "Accident detection and reporting system using GPS, GPRS and GSM technology." 2012 International Conference on Informatics, Electronics & Vision (ICIEV). IEEE, 2012. In this system GPS used to found where we are. Nowadays GPS receiver has become important part of the vehicle. This paper is about monitor the speed of the vehicle and sent the alert message to center of alert service. GPS will monitor speed of a vehicle and compare with the previous speed in every second. If the speed will be below the specified speed, it will assume accident has occurred. The system will then send the accident location with time. The Global Positioning System is a global navigation satellite system. Mobile phone listens the GPS signals and find GPS receiver figure out exactly what we searching for. It made up ground station, receiver, and satellite.

Desai A, Vikas, Swati P. Nawale, and Sachin R. Kokane. "Design and Implementation of GSM and GPS Based Vehicle Accident Detection System." IJIT 1.03 (2013): 1-4. The motorcycle accident is the huge major issue. The riders are not following the traffic rules. So, increase the death rate. This paper about whenever an accident occurred the wireless system sent the message to a one of the contact and nearby hospital and emergency medical service. This system will be designed for the motorcycle. This project going to be another solution for the uncertain situation car door locking system.

Vaishnavi A, M., et al. "Intelligent alcohol detection system for car." International Journal of Scientific & Engineering Research 5.11 (2014): 2229-5518. The detection system contain MQ-2 alcohol gas sensor detects the alcohol content in the human breath. This sensor detects the presence of alcohol. This sensor has high sensitivity and response time. If the driver of the car concept the alcohol indicates drunk otherwise indicate sober. 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.

Katkar A, Suhas, Mahesh Manik Kumbhar, and Priti Navanath Kadam. "Accident Prevention System Using Eye Blink Sensor." International Research Journal of Engineering and Technology (IRJET) 3.05 (2016): 1588-1590. This sensor detects the variation of the eye blinking. Eye-blinking Sensor is used to check whether driving person is sleep or not while driving. If eye opening the output is low and eye closed output is high.

The infra-red light is used to detect the sleeping while drive by reflected light. If any changes in the reflected light indicating the alert message. Driver drowsiness is recognized as an important factor in the vehicle accidents.

3. Hardware Development

The description of various hardware components used in the Vehicle Black Box using IoT are

3.1 Alcohol Sensor

Alcohol sensor is completely analog sensor which can detect the presence of alcohol gases with the concentration amount from 0.05 mg/L to 10 mg/L. The conductivity increases with the increase in the concentration of gases. Mq3 is the best module for detecting the alcohol glasses with low power and can easily interface with microcontroller, Arduino and Raspberry Pi. This sensor is commonly recognized as breath analyzer in our system.

3.2 GPS

GPS is the Global Positioning system used for location tracing commonly in real time applications. The GPS consists of 4 pins in which two are for providing the power and the rest of the two pins are receiver and transmitter. The GPS module continuously receives the data from the satellite and transmits data correspondingly. This model can support up to 55 channels and works on the principle of triangulation method. In our application, the GPS tracks the latitude and longitude of the vehicle and sent to the cloud for ease tracking.

3.3 GSM

Global system for mobile communication is a device used to send messages via SIM. GSM module consists of GSM/GPRS modem assembled together with the power supply and the communication interfaces. The working of the GSM module is purely on AT Commands. The MODEM is the soul of such modules. +When the GSM is connected to the microcontroller, the logical function of the sensors reaches the upper limit then the GSM activates to send the messages for the emergency contacts.

3.4 PIC16F877A

The PIC microcontroller PIC16f877a is one of the most renowned microcontrollers in the industry. This microcontroller is very convenient to use, the coding or programming of this controller is also easier. One of the main advantages is that it can be write-erase as many times as possible because it uses FLASH memory technology. It has a total number of 40 pins and there are 33 pins for input and output.

PIC16f877a finds its applications in a huge number of devices. It is used in remote sensors, security and safety devices, home automation and many industrial instruments. An EEPROM is also featured in it which makes it possible to store some of the information permanently like transmitter codes and receiver frequencies and some other related data. The cost of this controller is low and its handling is also easy. It is flexible and can be used in areas where microcontrollers have never been used before as in microprocessor applications and timer functions etc.

Figure 1 PIC16F877A

- It has a smaller 35 instructions set.
- It can operate up to 20MHz frequency.
- The operating voltage is between 4.2 volts to 5.5 volts. If you provide it voltage more than 5.5 volts, it may get damaged permanently.
- It does not have an internal oscillator like other PIC18F46K22, PIC18F4550.
- It is available in four IC packaging such as 40-pin PDIP 44-pin PLCC, 44-pin TQFP, 44-pin QFN

3.5 Relay

A relay is an electrically operated switch. It consists of a set of input terminals for a single or multiple control signals, and a set of operating contact terminals. The switch may have any number of contacts in multiple contact forms, such as make contacts, break contacts, or combinations thereof. Relays are used where it is necessary to control a circuit by an independent low-power signal, or where several circuits must be controlled by one signal. Relays were first used in long-distance telegraph circuits as signal repeaters: they refresh the signal coming in from one circuit by transmitting it on another circuit. Relays were used extensively in telephone exchanges and early computers to perform logical operations.

Figure 2 Relay

Latching relays require only a single pulse of control power to operate the switch persistently. Another pulse applied to a second set of control terminals, or a pulse with opposite polarity, resets the switch, while repeated pulses of the same kind have no effects. Magnetic latching relays are useful in applications when interrupted power should not affect the circuits that the relay is controlling.

3.6 LM 35

Temperature is one of the most commonly measured parameter in the world. They are used in your daily household devices from Microwave, fridges, AC to all fields of engineering. Temperature sensor basically measures the heat/cold generated by an object to which it is connected. It then provides a proportional resistance, current or voltage output which is then measured or processed as per our application.

Temperature sensors are basically classified into two types.

- Non-Contact Temperature Sensors: These temperature sensors use convection & radiation to monitor temperature.

- Contact Temperature Sensors: Contact temperature sensors are then further sub divided into three types, Electro-Mechanical (Thermocouples), Resistive Resistance Temperature Detectors (RTD) and Semiconductor based. (LM35, DS1820 etc.).
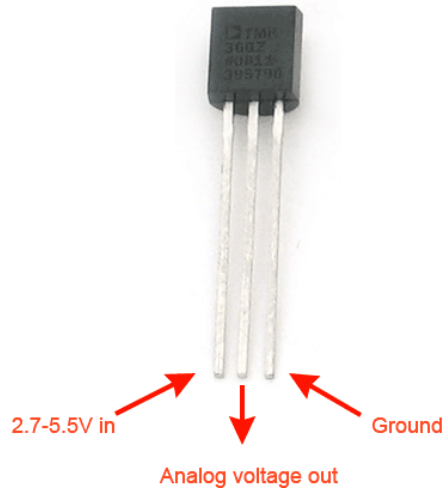
Figure 3 LM 35

Main advantage of LM35 is that it is linear i.e. 10mv/°C which means for every degree rise in temperature the output of LM35 will rise by 10mv. So if the output of LM35 is 220mv/0.22V the temperature will be 22°C. So if room temperature is 32°C then the output of LM35 will be 320mv i.e. 0.32V.
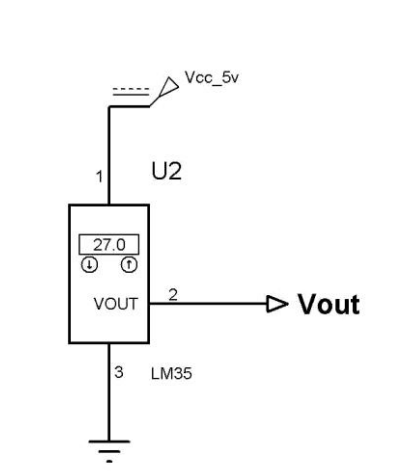

Figure 4 LM 35 configuration

3.7 LCD Display

LCD (Liquid Crystal Display) is a type of flat panel display which uses liquid crystals in its primary form of operation. LEDs have a large and varying set of use cases for consumers and businesses, as they can be commonly found in smartphones, televisions, computer monitors and instrument panels. LCDs were a big leap in terms of the technology they replaced, which include light-emitting diode (LED) and gas-plasma displays. LCDs allowed displays to be much thinner than cathode ray tube (CRT) technology. LCDs consume much less power than LED and gas-display displays because they work on the principle of blocking light rather than emitting it. Where an LED emits light, the liquid crystals in an

LCD produce an image using a backlight.

Figure 5 LCD Display

As LCDs have replaced older display technologies, LCDs have begun being replaced by new display technologies such as OLEDs. A display is made up of millions of pixels. The quality of a display commonly refers to the number of pixels; for example, a 4K display is made up of 3840 x2160 or 4096x2160 pixels. A pixel is made up of three sub pixels; a red, blue and green—commonly called RGB. When the sub pixels in a pixel change color combinations, a different color can be produced. With all the pixels on a display working together, the display can make millions of different colors. When the pixels are rapidly switched on and off, a picture is created.

3.7.1 Types of LCDs

- Twisted Nematic (TN)- which are inexpensive while having high response times. However, TN displays have low contrast ratios, viewing angles and color contrasts.

- In Panel Switching displays (IPS Panels)- which boast much better contrast ratios, viewing angles and color contrast when compared to TN LCDs.

- Vertical Alignment Panels (VA Panels)- which are seen as a medium quality between TN and IPS displays.

- Advanced Fringe Field Switching (AFFS)- which is a top performer compared IPS displays in color reproduction range.

4. Conclusions and Future Scope

In this Modern era, IoT Technology is improving rapidly to help the issues mostly concern the world. This paper mainly focuses on alerting the driver from the Collision situations and using Cloud Computing Services, the location can be easily traced. Our contribution is that we proposed a low power micro-controller which can be used in the hardware implementation as its main controller in the automation of this device. with the meaningful support of the Embedded systems, IoT and Cloud computing, we strongly believe that Intelligent Vehicle Black Box using IoT will be reliable, power efficient in the real time applications. In the Future scope the power can be almost decreased with the GPS and GSM modules which can easily integrated with systems.

References

1. Das A, A. Ray, A. Ghosh, S. Bhattacharyya, D. Mukherjee and T. K. Rana, "Vehicle accident prevent cum location monitoring system," 2017 8th Annual Industrial Automation and Electromechanical Engineering Conference (IEMECON), Bangkok, 2017, pp. 101-105.

2. G. Hayes, F. Blosser, "Motor Vehicle Crashes Claim More than a Million Lives Worldwide", CDC Injury Center Media Relations, Press Release, April, 2004.

3. Abdallah Kassem, Rabih Jabr, GhadySalamouni, Ziad Khairallah Maalouf, "Vehicle Black Box System", Proceedings of the 2nd Annual IEEE System Conference, IEEE 2008, pp. 1-6.

4. Byung Yun Lee, Yong Yoon Shin, Hyun Joo Bae, "Development of Insurance Server System based on Vehicle Driving Information ", Proceedings of 7th IEEE International Conference on Computing and Convergence Technology (ICCCT), 2012, pp. 156 – 159.

5. "Automatic Vehicle Accident Detection and Messaging System using GGM And GPS Modem" by C.Prabha, R.Sunitha, R.Anitha, IJAREEIE 7, July 2014.

6. Watthanawisuth, N., Lomas, T., and Tuantranont, A., "Wireless Black Box Using MEMS Accelerometer and GPS Tracking for Accidental Monitoring of Vehicles", Proceedings of IEEE-EMBS International Conference on Biomedical and Health Informatics (BHI), IEEE 2012, pp. 847 – 850.

7. Kassem A, R. Jabr, G. Salamouni, and Z. K. Maalouf, "Vehicle Blac k Box System," in System Conference, pp. 1-6, April 2008.

8. D. Jiang, and L. Delgrossi, "IEEE 802.11p: Towards an International Standard for Wireless Access in Vehicular Environments," in Technology Conference (VTC), pp. 2036-2040, May 2008.

9. Kumar, M. Anil, M. Venkata Suman, Yogesh Misra, and M. Geetha Pratyusha. "Intelligent Vehicle Black box using IOT." International Journal of Engineering & Technology (UAE)-SCOPUS March-2018 7, no. 2.7 (2018): 215-218.

10. Priyanka S G, Sanchita, Shreya S Gowda, Sushma B, Dr. Reshma Banu. "Accident Detection and Emergency Rescue Alert System". International Journal of Scientific Research in Computer Science, Engineering and Information Technology 2018, Volume 4, Issue 6.

11. R Dimple, Nanda B S. "Design and implementation of smart black box system for gathering the safety information in vehicles". International Journal of Advance Research, Ideas and Innovations in Technology. Volume 4, Issue 3,2018.