IJITCE

ISSN 2347- 3657

International Journal of Information Technology & Computer Engineering

Email : ijitce.editor@gmail.com or editor@ijitce.com

International Journal of Information Technology & Computer Engineering
ISSN 2347–3657
Volume 13, Issue 2, 2025

CAR BLACK BOX SYSTEM FOR ACCIDENT ANALYSIS USING IOT

[1] Mr.B.Obulareddy,M.Tech, Assistant professor,
[2] V.Gayathri, [3] P.Jagadeesh, [4] P.Venkata Dattatreya, [5] P.Archana [6] R.Uday Kumar
DEPARTMENT OF ELECTRONICS & COMMUNICATION ENGINEERING
CHAITANYA BHARATHI INSTITUTE OF TECHNOLOGY
VIDYA NAGAR, PALLAVOLU (V), PRODDATUR-516360, Y.S.R (Dt.), AP

ABSTRACT

The car black box is used to analyses the cause of accidents like an airplane black box. This paper proposes a model of a car black box system which can be installed in the cars. The aim of this paper is to achieve accident analysis by tracking the working process of vehicles. In addition to this, the car black box system sends an alert message to the user mobile which is connected through Bluetooth module. The black box system also uses GPS sensor to collect the data location. The car black box system mainly helps the insurance companies to do car crash investigations and to record the road status to prevent or decrease death rates. This paper proposes a technique to monitor the vehicle performance and the behaviour of the driver using sensors with the use of IoT technology., primarily driven by factors like speeding, drunk driving, distractions, red light violations, and negligence of safety measures. To address this concern, our project focuses on developing a do-it-yourself (DIY) black box with accident prevention and alcohol detection features.

This black box, traditionally used to record vehicle and occupant data during and after crashes, will be enhanced with Internet of Things (IoT) technology and various sensors to promptly alert vehicle owners of potential accidents or hazardous conditions. By deploying advanced sensors, the system aims to detect signs such as erratic driving behaviour and collision scenarios, contributing to a significant reduction in accidents. Additionally, the integration of alcohol detection technology enhances safety measures by identifying instances of drunk driving and notifying both the driver and vehicle owner in Realtime. This innovative approach aligns with the broader goal of creating a safer road environment in India, ultimately curbing the rising toll of road accidents..

Keywords: Microcontroller, fire sensor, vibrator sensor, alcohol sensor, IOT, LCD, buzzer

I. INTRODUCTION

1.1 INTRODUCTION

Microcontroller are widely used in Embedded Systems products. An Embedded product uses the microprocessor (or microcontroller) to do one task & one task only. A printer is an example of Embedded system since the processor inside it perform one task only

ISSN 2347–3657
Volume 13, Issue 2, 2025

namely getting the data and printing it. Although microcontroller is preferred choice for many Embedded systems, there are times that a microcontroller is inadequate for the task. For this reason, in recent years many manufactures of general-purpose microprocessors such as INTEL, Motorola, AMD & Cyrix have targeted their microprocessors for the high end of Embedded market. One of the most critical needs of the embedded system is to decrease power consumptions and space. This can be achieved by integrating more functions into the CPU chips. All the embedded processors have low power consumptions in additions to some forms of I/O, ROM all on a single chip. In higher performance Embedded system, the trend is to integrate more & more function on the CPU chip & let the designer decide which feature he/she wants to use.

1.2 EMBEDDED SYSTEM

Physically, embedded systems range from portable devices such as digital watches and MP3 players to large stationary installations like traffic lights, factory controllers, or the systems controlling nuclear power plants. Complexity varies from low, with a single microcontroller chip, to very high with multiple units, peripherals and networks mounted inside a large chassis or enclosure

In general, "embedded system" is not an exactly defined term, as many systems have some element of programmability. For example, Handheld computers share some elements with embedded systems such as the operating systems and microprocessors which power them but are not truly embedded systems, because they allow different applications to be loaded and peripherals to be connected. Embedded systems span all aspects of modern life and there are many examples of their use. Telecommunications systems employ numerous embedded systems from telephone switches for the network to mobile phones at the end-user. Computer networking uses dedicated routers and network bridges to route data.

EXAMPLES OF EMBEDDED SYSTEM:

Automated teller. machines (ATMS). Integrated system in aircraft and missile. Cellular telephones and telephonic switches. Computer network equipment, including routers timeservers and firewalls. Computer printers, Copiers. Disk drives (floppy disk drive and hard disk drive). Engine controllers and antilock brake controllers for automobiles. Home automation products like thermostat, air conditioners sprinkles and security monitoring system. House hold appliances including microwave ovens, washing machines, TV sets DVD layers/recorders. Medical equipment. Measurement equipment such as digital storage oscilloscopes, logic analysers and spectrum analysers. Multimedia appliances: internet radio receivers, TV set top boxes.Small hand-held computer with P1M5

International Journal of Information Technology & Computer Engineering
ISSN 2347–3657
Volume 13, Issue 2, 2025

and other applications. Programmable logic controllers (PLC's) for industrial automation and monitoring. Stationary video game controllers.

1.3 CHARACTERISTICS:

Embedded systems are designed to do some specific tasks, rather than be a general-purpose computer for multiple tasks. Some also have real-time performance constraints that must be met, for reasons such as safety and usability; others may have low or no performance requirements, allowing the system hardware to be simplified to reduce costs. Embedded systems are not always standalone devices. Many embedded systems consist of small, computerized parts within a larger device that serves a more general purpose. For example, the Gibson Robot Guitar features an embedded system for tuning the strings, but the overall purpose of the Robot Guitar is, of course, to play music. Similarly, an embedded system in an automobile provides a specific function as a subsystem of the car itself.

The software written for embedded systems is often called firmware, and is usually stored in read- only memory or Flash memory chips rather than a disk drive. It often runs with limited computer hardware resources: small or no keyboard, screen, and little memory.

1.4 MICROPROCESSOR (MP):

A microprocessor is a general-purpose digital computer central processing unit (CPU). Although popularly known as a "computer on a chip" is in no sense a complete digital computer. The block diagram of a microprocessor CPU is shown, which contains an arithmetic and logical unit (ALU), a program counter (PC), a stack pointer (SP), some working registers, a clock timing circuit, and interrupt circuits.

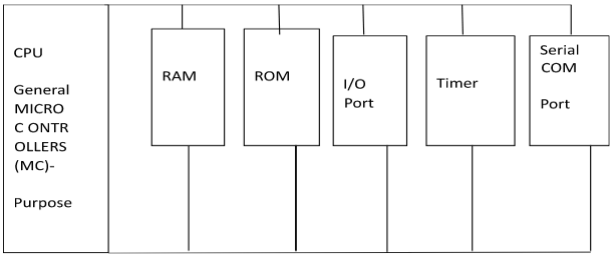


Fig 1.1 Block diagram of microprocessor

1.5 MICROCONTROLLER (MC):

Figure shows the block diagram of a typical microcontroller. The design incorporates all of the features found in micro-processor CPU: ALU, PC, SP, and registers. It also added the other features needed to make a complete computer: ROM, RAM, parallel I/O, serial I/O, counters, and clock circuit.

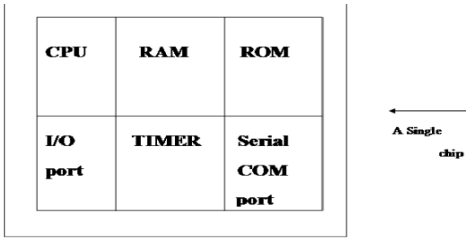


Fig 1.2 Microcontroller

1.6 COMPARISION BETWEEN MICROPROCESSOR AND MICROCONTROLLER

The microprocessor must have many additional parts to be operational as a computer

ISSN 2347–3657
Volume 13, Issue 2, 2025

whereas microcontroller requires no additional external digital parts. The prime use of microprocessor is to read data, perform extensive calculations on that data and store them in the mass storage device or display it. The prime functions of microcontroller is to read data, perform limited calculations on it, control its environment based on these data. Thus the microprocessor is said to be general-purpose digital computers whereas the microcontroller are intend to be special purpose digital controller. Microprocessor need many opcodes for moving data from the external memory to the CPU, microcontroller may require just one or two, also microprocessor may have one or two types of bit handling instructions whereas microcontrollers have many.

II. LITERATURE SURVEY

2.1 INTRODUCTION

The World Health Organization (WHO) says that every year millions of people demise due to vehicle accidents. To prevent this, the car black box system is introduced. Like black box in flight, the car black box technology can play a vital role in vehicle crash investigations. Hence it is significant to have recorders which will track all the activity in vehicles during and after accident or crash. This car black box system is mainly classified into two sections. First section detects and collects the information from the vehicle, and it is implemented using various type of sensors. Second section presents the data to the user in simplified way, and it is implemented by using the Node microcontroller (MCU) which is programmed to record the data and to retrieve the data from the Node MCU. If any vehicle crashes, the geographical co-ordinates or location is sent to the pre-stored mobile number to seek help. The investigators can use this recorded data obtained from the car black box to identify the actual reason of the accident. The black box will give the input about soundness of vehicle and accidents/mishaps and information including the vehicles mechanical and electrical status.

The black box will give the moment criticism for any physical oddities and will provide the war room access to the information on the black box. The black box can be utilized by Field Technician Soldiers, and Command Centre specialist to analyse and fix any issues that may emerge while out on the field or at command post. A data investigator can utilize the black box to decide the reason for the mishap and give approaches to forestall a future mishap. Field professionals and travellers in the vehicle can utilize the black box on the field to decide vehicle status. At the command centre, mechanics and investigators will utilize the black box to recognize any irregularities with the vehicle, to record ordinary activity information, and to decide the reasons for mishaps if any ought to happen.

2.2 LITERATURE SURVEY

According to the World Health Organization, more than a million people in the world die

ISSN 2347–3657
Volume 13, Issue 2, 2025

each year because of transportation-related accidents. In order to react to this situation, the black box system draws the first step to solve this problem that crosses national boundaries and threatens the safety and health of people worldwide. Introduced to a part of the United States market in 1999, the black box system proved to be efficient.

However in the latter case, the system was embedded in the vehicle. Therefore, in addition to improving the treatment of crash victims and the road status in order to decrease the death rate, constructing safer vehicles, and helping insurance companies with their vehicle accidents investigations, the main purpose of this paper is to develop a black box system that can be installed to any vehicle all over the world. Like flight data recorders in aircraft, “black box” technology can now play a key role in motor vehicle crash investigations .

A significant number of vehicles currently on the roads contain electronic systems that record information in the event of a crash. That is why it is so important to have recorders that objectively track what goes on in vehicles before, during and after a crash as a complement to the subjective input that is taken usually from victims, eye witnesses and police reports. This system is committed mainly to two approaches. The first one is how to detect and record data from the vehicle. The second is how to present the data recorded to the user in a simplified way. To implement the first.

III. PROBLEM STATEMENT

Traditional car black boxes record vehicle and occupant data during and after crashes.These systems are often limited to post-accident analysis and do not provide real-time alerts or preventive measures..

DISADVANTAGES OF EXISTING SYSTEM

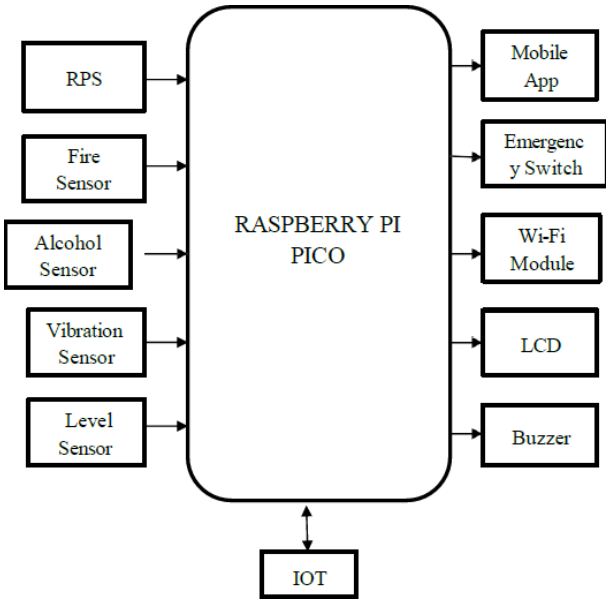
Lack of real-time monitoring and alerts. Limited to post-accident data analysis.Inability to detect and prevent accidents caused by factors like drunk driving or erratic behavior.Often expensive and not easily accessible for DIY implementation.

IV. PROPOSED SYSTEM

A DIY car black box system enhanced with IoT technology and various sensors. Real-time monitoring of vehicle performance and driver behavior.Integration of GPS for location tracking and Bluetooth for mobile alerts. Features accident prevention and alcohol detection technology. Alerts vehicle owners of potential hazards in real-time.

4.1 BLOCK DIAGRAM OF PROPOSED SYSTEM

International Journal of Information Technology & Computer Engineering
ISSN 2347–3657
Volume 13, Issue 2, 2025



V. BLOCK DIAGRAM OF PROPOSED SYSTEM

HARDWARE COMPONENTS

The following hardware tools used in the proposed system

Power Supply, Raspberry Pi PICO, Fire Sensor, Alcohol Sensor, Vibration Sensor, Level Sensor, Switch,Wi-Fi Module, LCD, Buzzer

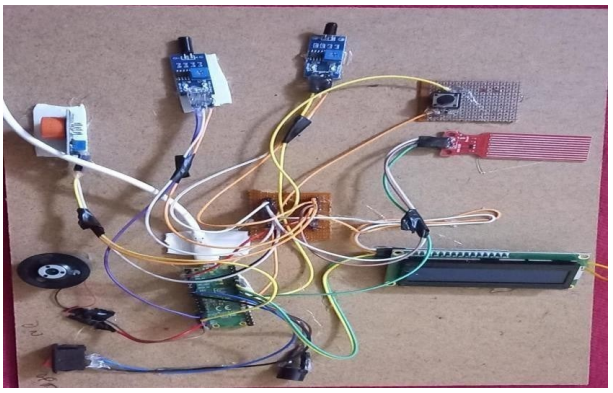
SOFTWARE COMPONENTS

The following software tools used in the proposed system : Arduino IDE, Proteus

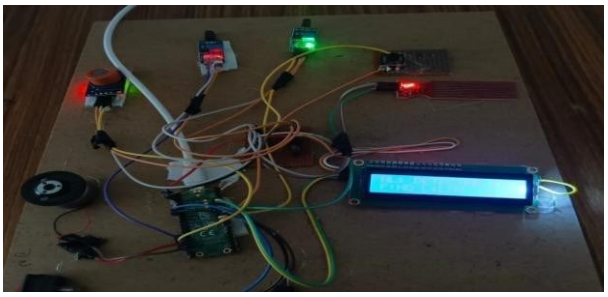
TECHNOLOGY USED

IOT

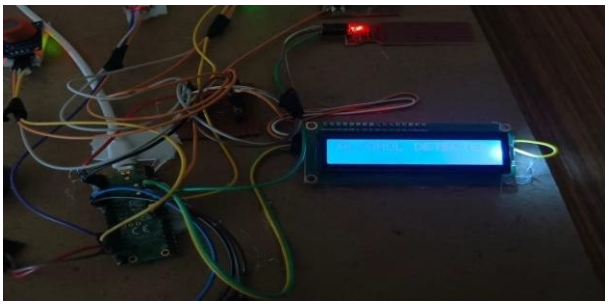
VI. RESULT AND DISCUSSION



This is our project, which involves a Microcontroller-based system featuring on LCD display, sensors, and power supply. It is designed for alerting vehicle owners in real-time potential hazards possibly in IOT applications



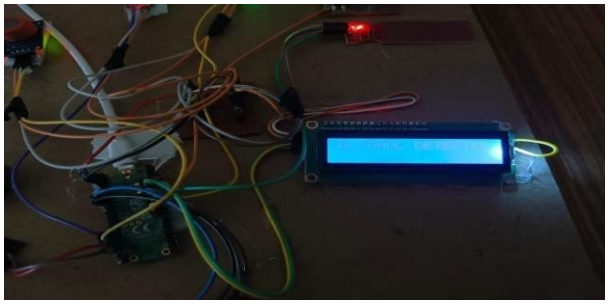
A Car Black Box System for Accident Analysis Using IOT alerts vehicle owners in real time to potential hazards. That records and transmits data related to vehicle performance, driver behaviour, and accidents. It can provide crucial insights during accident analysis



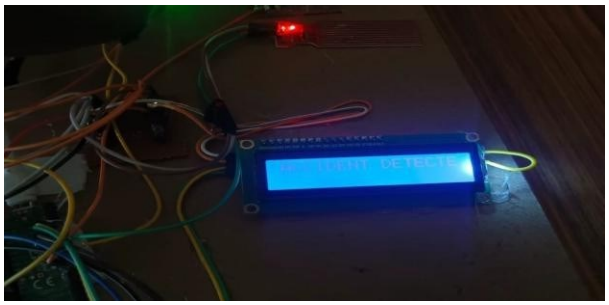
A Car Black Box System for Accident Analysis Using IOT alerts vehicle owners in real time to potential hazards. That records and transmits

International Journal of Information Technology & Computer Engineering
ISSN 2347–3657
Volume 13, Issue 2, 2025

data related to vehicle performance, driver behaviour, and accidents. It can provide crucial insights during accident analysis.

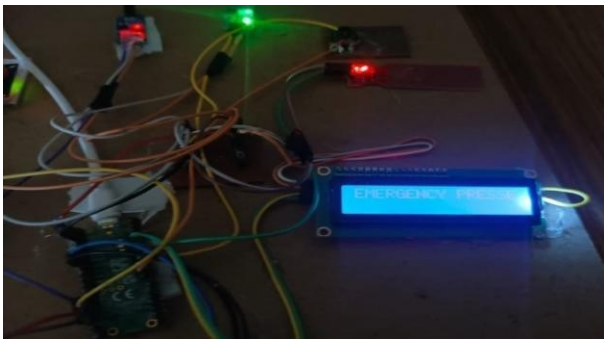


The LCD screen in the image displays that the alcohol detection when the sensor detects the alcohol then it displays in the LCD.

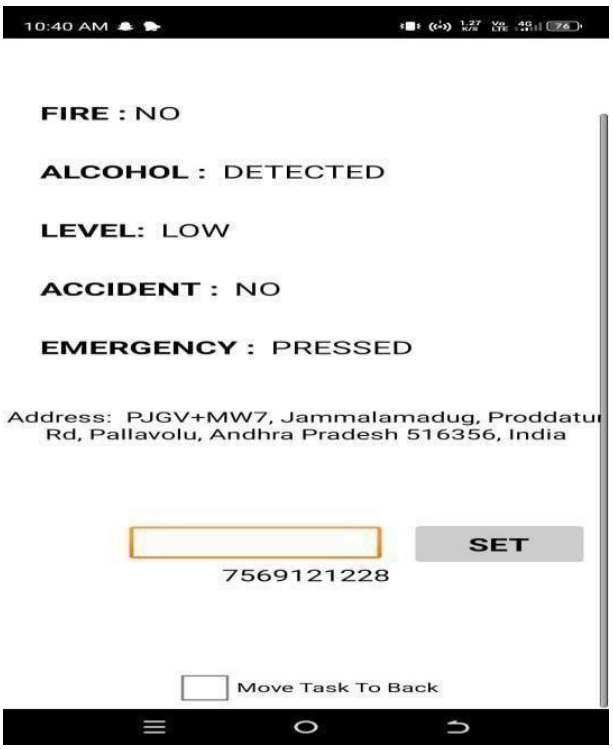


The LCD screen displays accident detected. This means when any sensor detected then it display accident detected in LCD.

The above figure shows that which sensors should be detected. This will display in the mobile which is connected with the hotspot.

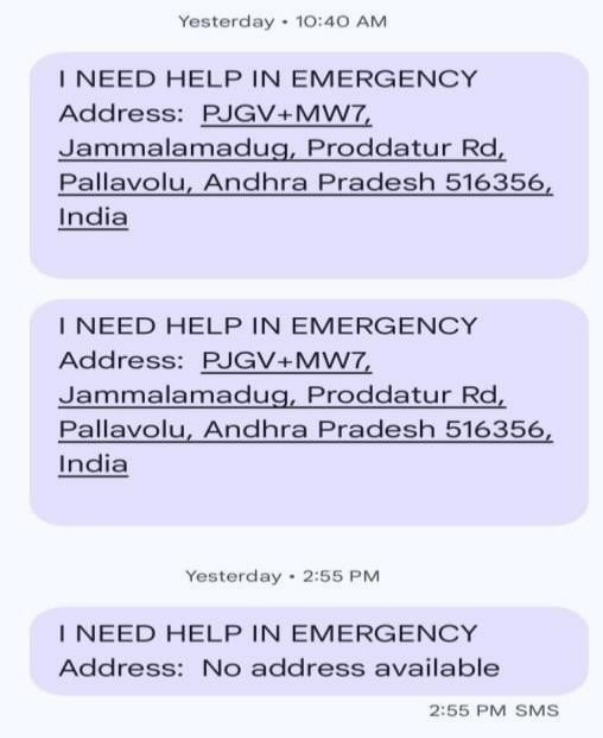


The LCD screen displays that if any sensor detected press the emergency button. Then it will displays like above.



After pressing the emergency button then it will shows like above in the users mobile

International Journal of Information Technology & Computer Engineering
ISSN 2347–3657
Volume 13, Issue 2, 2025



The above figure shows that after pressing the emergency button message send to the owners mobile i.e which mobile number should be entered by the user**.**

VII. CONCLUSION

To solve global concerns, the Internet of Things (IoT) technology of today is quickly developing. The alerting of the driver in collision situations is the primary focus of this paper, and the location can be easily tracked by utilizing Cloud Computing Services. We offered a low-power microcontroller that could act as the device's main controller during automation in the hardware implementation as our contribution. We are certain that with major assistance from embedded systems, the Internet of Things, and cloud computing, the Intelligent Vehicle Black Box leveraging IoT will be dependable and power efficient in real-time applications. In the future, power consumption can be greatly decreased by GPS and GSM modules, which can be readily added into hardware, have a rechargeable battery, and can operate the device for a longer amount of time. The suggested system's objective is to offer details regarding the accident's location. Receiving

help and aid for the accident victim is made simpler. This system's Wi-Fi module is utilised to find the car. To deliver accident information. The suggested systems deliver results that are adequate

REFERENCE

1. G. Hayes, F. Blosser, “Motor Vehicle Crashes Claim More than a Million Lives Worldwide”, CDC Injury Center Media Relations, Press Release, April, (2004).

2. Abdallah Kassem, Rabih Jabr, Ghady Salamouni, Ziad Khairallah Maalouf, “Vehicle Black Box System”, Proceedings of the 2nd Annual IEEE System Conference, IEEE (2008).

3. Y. Ji, S. Wang, Y. Zhao, J. Wei, and Y. Lu, ‘‘Fatigue state detection based on multi-index fusion and state recognition network,’’ IEEE Access, 7 (2019).]

4. C Bhuvaneshwari, A Manjunathan, “Reimbursement of sensor nodes and path optimization”, Materials Today: Proceedings, 45 (2021).

5. Koichi Fujiwara, Erika Abe, Keisuke Kamat, Chikao Nakayama, Yoko Suzuki, Toshitaka Yamakawa, “Heart Rate Variability-based

ISSN 2347–3657
Volume 13, Issue 2, 2025

Driver Drowsiness Detection and its Validation with EEG," IEEE Transactions on Bio. Engg. 66, 6, (2019).

6. G. Hayes, F. Blosser, "Motor Vehicle Crashes Claim More than a Million Lives Worldwide", CDC Injury Center Media Relations, Press Release, April, 2004 (PDF) Vehicle Black Box System. Available from: https://www.researchgate.net/publication/4334587_Vehicle_Black_Box_System [accessed Jul 06 2021].

7. Lilia Filipova-Neumann, Peter Welzel, ―Reducing asymmetric information in insurance markets: Cars with black boxes‖, Telematics and Informatics, 2010, pp 394-403, DOI: 10.1016/j.tele.2010.03.003.

8. Thomas K. Kowalick, "Black Boxes: Event Data Recorder Rulemaking for Automobiles", MICAH, summer 2006.

9. L. Dae Geun, J. Se Myoung, L. Myoung Seob, "System on Chip design of Embedded Controller for Car Black Box", Intelligent Vehicles Symposium IEEE 2007, pp. 1174-1177, 13 June 2007.

10. [5]. Daesik Ko and Hwase Park, "A design of the Intelligent Black-Box using Mining Algorithm", InternationalJournal of Smart Home, Vol.6, No.2, April 2012, pp1-4.