

IOT BASED BLACK BOX SYSTEM FOR AUTOMOBILES

Submitted in partial fulfilment of the requirements for the award of
Bachelor of Engineering degree in Electronics and Communication Engineering

by

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(DEEMED TO BE UNIVERSITY)**

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BONAFIDE CERTIFICATE

This is to certify that this Project Report is the bonafide work of **D. ABHINASH (40130286), K. ABHISHEK (40130287)** who carried out the project entitled "**IOT BASED BLACK BOX SYSTEM FOR AUTOMOBILES**" under our supervision from June 2023 to April 2024.

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ABSTRACT

Nowadays automobiles technologies are rapidly increase each year and also every second accident count also increase. So while using some technologies like black box placed in the automobile means creating a new level of data service in vehicle. The automobile black box has functions similar to an airplane black box. It is highly useful to analyses the cause of vehicular accidents and prevent the loss of life and property arising from vehicle accident. These paper presents the prototype automobile black box system it is having the group of sensor and also gives the black box sends an alert message to pre stored mobile number in the way of way2sms in the case of an accident Millions of people die due to accidents. The vehicle accident is a major public problem in many countries. This problem is still increasing due to rider's rash driving and drunk and drive. This problem can be solved by using Black Box system analysis. Automobiles and computer technologies are creating a new level of data service in vehicles. The automatic Black Box has functions similar to an airplane Black Box. It is used to analyse the cause of vehicular accident and prevent the loss of life and property arising from the vehicle accidents. This paper proposes a prototype of an automatic Black Box.

TABLE OF CONTENTS

Chapter No	TITLE	Page No.
	ABSTRACT	v
	LIST OF FIGURES	viii
1	INTRODUCTION	1
	1.1 BACKGROUND	2
	1.2 PROJECT OBJECTIVE	3
	1.2.1 OVERVIEW	3
	1.3 AIM OF THE PROJECT	4
2	LITERATURE SURVEY	6
3	REQUIREMENT ANALYSIS	9
	3.1 METHODOLOGY	9
	3.2 HARDWARE RESOURCES	10
	3.2.1 MICROCONTROLLER(ARDUINO MEGA)	10
	3.2.2 ELM327 OBD BLUETOOTH ADAPTER	10
	3.2.3 SD CARD MODULE	11
	3.2.4 BLUETOOTH MODULE	12
	3.2.5 GPS MODULE THE NEO-6M GPS	12
	3.2.6 WIFI MODULE THE ESP8266	13
	3.3 SOFTWARE RESOURCES	13
	3.3.1 ARDUINO IDE	13
	3.3.2 ANDROID STUDIO	13
	3.3.3 FIREBASE DATABASE	14
	3.4 SYSTEM REQUIREMENTS	14
	3.4.1 HARDWARE REQUIREMENTS	14
	3.4.2 SOFTWARE REQUIREMENTS	14
4	DESCRIPTION OF PROPOSED SYSTEM	15
	4.1 EXISTING SYSTEM	15
	4.2 PROPOSED SYSTEM	15

4.2.1	ADVANTAGES	15
4.3	WORKING PRINCIPLE	16
4.3.1	DATA COLLECTION	17
4.3.2	DATA TRANSMISSION	17
4.3.3	DATA STORAGE AND ANALYSIS	17
4.3.4	EVENT DETECTION AND ALERTS	17
4.3.5	REMOTE ACCESS AND CONTROL	18
4.3.6	COMPLIANCE AND REPORTING	18
5	IMPLEMENTATION AND ANALYSIS	19
5.1	HARDWARE DESIGN	19
5.1.1	ARDUINO UNO AND ITS PROGRAMMING	19
5.1.2	ARDUINO UNO	19
5.2	INPUT AND OUTPUT	20
5.3	COMMUNICATION	21
5.4	WHY ARDUINO	22
5.5	SENSORS	23
5.5.1	TEMPERTURE SENSOR	23
5.5.2	GAS SENSOR	24
5.5.3	VIBRATION SENSOR	24
6	RESULTS AND CONCLUSION	25
6.1	RESULT	25
6.2	CONCLUSION AND FUTURE SCOPE	26
	REFERENCES	27

LIST OF FIGURES

FIG NO	FIG NAME	PAGE NO
3.1	MICROCONTROLLER	10
3.2	BLUETOOTH ADAPTER	11
3.3	SD CARD MODULE	11
3.4	BLUETOOTH MODULE	12
3.5	GPS MODULE	13
3.6	WI-FI MODULE	13
4.1	BLOCK DIAGRAM	16
5.1	TEMPERATURE SENSOR	23
5.2	GAS SENSOR	24
5.3	VIBRATION SENSOR	24
6.1	RESULT	25
6.2	RESULT	25

CHAPTER 1

INTRODUCTION

- A car is the consequence of joined work of various frameworks. Every framework, however essentially free, be impacted by the impact of different frameworks connecting with it.
- Before talking about the cooperation of different frameworks, let us initially specify the different frameworks that are available in a vehicle. It is utilized to examine the reason for vehicular mishaps and forestall the death toll and property emerging from vehicle mishaps.
- The Motor Vehicles (Amendment) Bill, 2016 have been recorded for thought and entry in the present Budget Session of Parliament. It looks to deliver issues identified with street mishaps, outsider protection, and street well-being measures.
- Right now, present a few information on street mishaps, reasons for mishaps, and engine vehicle outsider protection.

According to the World Health Organization, more than a million people in the world die each year because of transportation-related accidents. Now, a day's many accidents are happening because of the alcohol consumption of the driver or person. Hence drunk driving is a major reason of accidents in almost all countries all over the world. The project is developed to record informational data, such as: speed of car temperature of engine, etc. to revolutionize the field of motor vehicle accidents investigation. It can also use for vehicle mapping and accident alert with the help of GPS and GMS technology. 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. As we know current accident ratio. There are different reasons behind the accident. Considering the practical aspects after accident we need to prepare for all insurance, Policy Claims. There are several clause

in policies, to satisfy each and every clause we need proper documentation. To get, that black box will help us. Black box will help you and insurance company too in order to conclude claims. In addition to that we will have accident tracking system. Whenever the vehicle meet with an accident an Alert Message will be sent to Home contact number including current GPS location of vehicle. This system will help to save life of people. Technically black box is used as a safe to store system safely. At any Environmental condition it will remain as it is. Black box is used to store different parameter of vehicle in memory card.

1.1.BACKGROUND

Due to the increasing incidences of air crashes in the year 1953-54, it was thought that a system could be created that could provide data on the causes for the plane accident and could also help to save planes from accidents. So, the black box is invented and it is also known as 'Flight Data Recorder'. An airplane's Black Box or Flight Data Recorder is a tool that records all of the airplane's activities during its flight. For safety reasons, Black Box is usually kept at the rear of the airplane. This box is made from titanium steel and is included in a titanium container that allows it to withstand shocks if it falls into the sea or from the height. The black box is composed of two different aircraft boxes that are Flight Data Recorder (FDR) and Cockpit Voice Recorder (CVR). The FDR is a tool used to monitor specific aircraft output parameters. An FDR has the function of capturing and storing data from several aircraft sensors on a platform designed to survive a crash. The CVR is used to record audio in the deck to investigate injuries and incidents. The CVR monitors and maintains the audio signals of the microphones and earphones and the area mounted in the cockpit of the pilot headsets

Each year, 1.35 million people are killed on roadways around the world [4275]. Some of these accidents can be prevented by just being more cautious while driving. Also these accidents cause various roadblocks in the way of insurance companies legalizing the case and deciding whose fault the accident actually was. Police investigation also sometimes takes a while in finding the root cause of the problem.

The system proposed in this research paper solves majority of these problems. As automobiles aren't as complicated as airplanes, detecting flaws in automobiles is much more easier than finding flaws in an airplane crash. The system proposed doesn't only act as an event data recorder but also as a live feedback information system providing information regarding various stats of the car provided by the OBD (On-Board Diagnostics) port. As OBD port is a built-in feature in cars, this system is much more widely approachable as it can be used in already existing cars as well as newer models. The police as well as the insurance companies can use the black box as potential evidence for the investigation of crashes.

1.2. PROJECT OBJECTIVE

Millions of people die due to accidents. The vehicle accident is a major public problem in many countries. This problem is still increasing due to rider's rash driving and drunk and drive. This problem can be solved by using Black Box system analysis. Automobiles and computer technologies are creating a new level of data service in vehicles. The automatic Black Box has functions similar to an airplane Black Box. It is used to analyze the cause of vehicular accident and prevent the loss of life and property arising from the vehicle accidents. This paper proposes a prototype of an automatic Black Box

1.2.1 OVERVIEW

The black box concept is derived from the aviation industry, a flight recorder, colloquially known as black box. Although it is now orange colored for easy search, is an electronic recording device laced in an aircraft for the purpose of the investigating aviation accidents and incidents. With the advancement in technology and cost coming down, in our project we attempt to build similar device for our cars, not only this device will helps us in post crash analysis but also it helps us in post-crash analysis but also it will help us in quicker emergency rescue operation. research has been targeted towards building an integrated systems for emergency rescue services in the event of a road accident.

1.3. AIM OF THE PROJECT

The project aims to find the occurrence of any incident and to report the position of Incident with the previously fed contact number so that immediate assistance can be provided by ambulance to patient. Nowadays automobiles technologies are rapidly increasing each and every year and also each and every second accident count also increase. So while using some technologies like black box placed in the automobile means creating a new level of data service in vehicle. The vehicle black package has occupation comparable to an aircraft black package. It is highly useful to analyze the cause of vehicular accidents and prevent the loss of life and property arising from vehicle accident. In today's world as the population increases day by day the numbers of vehicle also increases on the road and highways. These results in accident that leads to the traffic jams and people do not get the help instantaneously. Road accidents constitute the major part of the accident deaths all over the world. This takes a toll on the property as well as causes human life loss because of unavailability of immediate safety facilities. During 2008, Road Traffic Injuries ranked fourth among the leading causes of death in the world. Nearly 1.3 million people die every year on the world's roads and 20 to 50 million people suffer non-fatal injuries, with many sustaining a disability as a result of their injury. Road traffic injuries are the leading cause of death among young people aged 15-29 years. If no action is taken, road traffic crashes are predicted to result in the deaths of around 1.9 million People annually by 2020. Those who live, has a high chance of incurring a disability as a result of the impact. 91% of the fatalities on the roads occur in middle- and low-income countries. Many campaigns have been conducted by the people for the awareness, but this problem is still increasing due to rider's poor behaviors such as speed driving, drunk driving, riding without sufficient sleep, etc. The numbers of death and disability are very high because of late assistance to people who got the accident. These cause huge social and economic burdens to people involved. Therefore, several research group and major motorcycle manufacturers have developed safety devices to protect riders from accidental injuries. However, good safety device for vehicles is difficult to implement and very expensive. Complete accident prevention is unavoidable but at least repercussions can be reduced. In highly populated Countries like India, everyday

people lose their lives because of accidents and poor emergency facilities. These lives could have been saved if medical facilities are provided at the right time. In many situations the family members or the ambulance and police authority is not informed in time. This result in delaying the help reached to the person suffered due to accident. In order to give treatment for injured people, first we need to know where the accident happened through location tracking and then send a message to your related one or to the emergency services. Many cases remain pending due to unknown reason of an accident. In order to react to this situation, the black box system draws the first step to solve problem. It is referred as electronic data recorder. It records main driving data such as Engine Temperature, Distance from obstacle, Speed of vehicle, Brake status, CO2 Content, Alcohol content, Accident Direction, trip Time and Date. The recorded data will be analyzed to find out reason for the accident easily and to settle many disputes related to accident such as crash litigation, insurance settlements. It can be used to not only reconstruct what happened before an accident by Insurance agents and police but improve vehicle design, roadway design and emergency medical service by automakers, government and hospital.

CHAPTER 2

LITERATURE SURVEY

[1] A. Das, 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.

Rate of road accidents is increasing day by day. Fatal road accidents can be easily avoided by understanding the psychological state of a driver. Majority of road accidents occur during night driving due to the drowsiness state of a vehicle driver. The paper provides mechanism to reduce accidents to a large extent by monitoring eye blinking of the driver which indicates the drowsiness, obstacles located in the road and the drunken state of the drivers. Automatic pre-cautionary system is activated based on the above alarming condition. Accident and its probable location are also generated at the nearby police station that helps initiating medical help. In normal cases no medical help is received due to the non-availability of accident information. This happens mainly at night and in roads where the traffic is low.

[2] Manish Bhelande, Viraj Chaudhari, Prathamesh Gore, Raj Dhure, Abhishek Bhayye." Car Black Box". International Journal of Advanced Research in Computer and Communication Engineering Vol. 5, Issue 3, March 2016.

Vehicle black box is an eventual vehicle tracking system that sits on the dashboard for observing the performance of the vehicle and driver behavior ensuring safety & security of the vehicle as well as the driver. The main purpose of this project is to create an Internet of Things (IoT) model of the Vehicle Black Box System (VBBS) that can be mounted in any vehicle all over the world.

[3] 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.

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.

[4] K. Mukherjee, "Anti-theft vehicle tracking and immobilization system," 2014 International Conference on Power, Control and Embedded Systems (ICPCES), Allahabad, 2014, pp. 1-4.]

With the increase in the number of vehicles on road, there has been a marked increase in the number of crimes involving vehicle theft. In spite of several stringent laws being in place and security measures taken by car manufacturers, thieves still find a way to remain one step ahead and vehicle theft is still among one of the most reported crimes worldwide. Due to the expensive nature of motor vehicles, there is ample incentive for petty thieves to attempt thefts and a simple redecoration of the exterior makes it almost impossible to track the stolen vehicles.

[5] Z. Liu, A. Zhang and S. Li, "Vehicle anti-theft tracking system based on Internet of things," Proceedings of 2013 IEEE International Conference on Vehicular Electronics and Safety, Dongguan, 2013, pp. 48-52.

As the amount of urban vehicle grows rapidly, vehicle theft has become a shared concern for all citizens. However, present anti-theft systems lack the tracking and monitoring function. The vehicle anti-theft tracking system based on Internet of things is designed in this article, which can provide all-round active service for the owners. This system is controlled by an RFID module to switch on and off.

[6] G. S. Prasanth Ganesh, B. Balaji and T. A. Srinivasa Varadhan, "Antitheft tracking system for automobiles (AutoGSM)," 2011 IEEE International Conference on Anti-Counterfeiting, Security and Identification, Xiamen, 2011, pp. 17-19.

Technology achieves success only when it meets every stratum of people. Apart from the various GPS tracking devices this paper introduces a first of its kind vehicle tracking

system that works only using GSM technology, which would be the cheapest source of vehicle tracking anti-theft system. It is a small kit that consists of a GSM module and several other components. The system can be switched ON by an SMS from the owner, which in turn instructs the microcontroller to turn OFF the vehicle, receive information about the vehicle's current location or more.

[7] 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.

This paper presents Smart blackbox system is to collect the accident or safety information means when information is needed after an accident or crime happened, investigators or police can find possible clues by hand. A vehicle accident is one of the most important issues around the world due to the increase of traffic and also due to rash driving of the drivers. This information is helpful for to check the car status and also useful for to investigate the accident and inform to family member. Blackbox system is used to record and store vehicle location and time, temperature, obstacle present or not in real time and store the collected information in history.

[8] M. R. Priyadharshini and Dr. Padmavathi S., "Survey on Vehicle Detection techniques", International Journal of Engineering Research & Technology (IJERT), vol. 3, no. 3, pp. 420 - 423, 2014.

Vehicle black box is an eventual vehicle tracking system that sits on the dashboard for observing the performance of the vehicle and driver behavior ensuring safety & security of the vehicle as well as the driver. The main purpose of this project is to create an Internet of Things (IoT) model of the Vehicle Black Box System (VBBS) that can be mounted in any vehicle all over the world.

CHAPTER 3

REQUIREMENT ANALYSIS

3.1. METHODOLOGY

In this proposed work, a novel method of accident detection system used to track the vehicle using GSM and GPS technology. In this system we used temperature sensor, alcohol sensor, speed sensor, microcontroller, LCD and GPS module GSM module whenever the car will be start, at this time the entire sensor will be in active mode and then start to read the parameter.in this way the entire sensor will monitor the car performance. Since the control unit is receive all the data from the sensor. And then show all the parameter value on LCD at a time. In this system the heart of proposed system is microcontroller. The entire peripheral sensor connected to the microcontroller. Ideally system will read the different parameters like temperature, speed, alcohol percentage present in the car and continuously display on LCD. In this system we also insert memory card which is connected to microcontroller of the system. Will save the data of every parameter. When the accident occurred, then the particular location of this incident will trace by using GPS technology. On detecting accident this system will get current location coordinate from GPS module. The GSM module will send the alert message to the victim relatives to predefine contact number at the same time memory card will have to store the resend data which could be recovered at service station for helping insurance companies with their vehicle crash investigation. at service center memory card will be connected to PC to read all the data stored in it.

3.2. HARDWARE RESOURCES

This section shows the various hardware components used in the system. The block diagram shows all the system flow of various components, to the centre microcontroller which is Arduino mega. The various components used are as follows:

3.2.1 Microcontroller (Arduino Mega)

The Arduino mega is the bigger version of Arduino UNO. It is a microcontroller based on At Mega 2560. It is designed for projects requiring more I/O lines, more RAM and more sketch memory. This microcontroller is used as the central hub in the system as it interacts with every component of the system. To describe the system circuit, the GPS module uses 4 lines, the Bluetooth chip uses 5 lines, the SD card reader uses 6 lines and the Wi-Fi module uses 8 lines.



Fig 3.1 Microcontroller

3.2.2 ELM327 OBD Bluetooth Adapter

ELM327 is a Bluetooth device, which uses the OBD port present in the car as the input device and scans all the present data of the given automobile. The ELM327 adapter connects with the microcontroller with help of Bluetooth and transmits the given data to the microcontroller, which further works on the data. This Bluetooth protocols into a serial data communication, which communicates with the Arduino.



Fig 3.2 Bluetooth Adapter

3.2.3 SD Card Module

The SD card module interacts with the Arduino to receive data and store the data in the SD card. It allows the Arduino to communicate with the SD card, as it is an important part of the system as it is crucial for the system to act as an event data recorder.



Fig 3.3 SD card

3.2.4 Bluetooth Module

The module HC-05 is used for the Bluetooth communication of the system as required by the ELM connector to transfer the signals via Bluetooth to the microcontroller. HC-05 supports full duplex communication to the system and add much functionality to the system. It has a 2.4 GHz radio transceiver and baseband.



Fig 3.4 Bluetooth module

3.2.5 GPS Module the NEO-6M GPS

Module used in the system is a global position system module, which provides accurate location of the system it is installed in. The GPS module in our system is interfaced with the Arduino microcontroller and provides real time location tracking to the board. Our system also has an antenna extender used in conjunction with the module to extend its signal.



Fig 3.5 GPS module

3.2.6 Wi-Fi Module the ESP8266

This module is a low-cost Wi-Fi microchip, with a full TCP/IP stack and microcontroller capability. This Wi-Fi module is used in our system so that the microcontroller can interact with the servers, which sends the data to the host application.



Fig 3.6 Wi-fi Module

3.3 SOFTWARE RESOURCES

3.3.1 Arduino IDE

Arduino IDE is an open source IDE that is primarily used for writing and uploading codes on any Arduino certified board and can be used in various environments. We used this IDE to upload the final code on the Arduino mega microcontroller.

3.3.2 Android Studio

Android studio is the platform used here to develop an application for the live updates of the car sent by the microcontroller via Wi-Fi Module. Android studio is an open source platform and can be used by anyone to create an android application.

3.3.3 Firebase Database

The Firebase Real-time Database is a cloud-hosted NoSQL Database that lets you store and sync data between your users in real-time. This database is being used by us to store the data coming from the car, which is then extracted by the android application

3.4 SYSTEM REQUIREMENTS

3.4.1 HARDWARE REQUIREMENTS

- Arduino
- Node MCU
- Temperature sensor
- Seat belt
- Vibration sensor
- Crash sensor
- Alcohol sensor
- Gas sensor

3.4.2 SOFTWARE REQUIREMENTS

- ARDUINO IDE
- Language: Embedded C

CHAPTER 4

DESCRIPTION OF PROPOSED SYSTEM

4.1 EXISTING SYSTEM

- Normally black box cost is high so no one prefer to install in the vehicle and normally black box is just store the data
- In existing system black box is done by using the sensors with gsm if any of the parameter reach above the threshold level it sends only the message
- In an existing system circuits looks bulky not in compact
- In this system use GSM & GPS communication.

DRAWBACKS

- Only speed can be monitored
- Accident can't be noted

4.2 PROPOSED SYSTEM

- To monitor the various sensors such as alcohol sensor, temperature sensor, Gas sensor, Touch sensor, Crash sensor, Vibration sensor and GPS are connected to Arduino board
- The output of the sensors is read from Arduino and communicated to single board computer. Theses data are uploaded into the node mcu board.
- The data is stored on the SD card and also in the cloud the given system is proposed in IOT
- We can get the live update through the gps and IOT Technology

4.2.1 ADVANTAGES:

The proposed system is designed such that, the device itself sends a message to the concerned person when an accident is met. Proposed system uses Node MCU Arduino board that provides an easy access to input/output and analog pins and easy burning/uploading of a program. The system uses GPS to find the location of the accident and to send that location in the form of SMS to the previously coded number. It also includes the feature to detect the presence of alcohol. To monitor the various sensors, GPS are connected to Arduino board which is Node MCU. Arduino board is

connected to Ubidots (open source cloud).The output of the sensors is read from Arduino and communicated to single board computer. The data is stored in the cloud the given system is proposed in IOT.

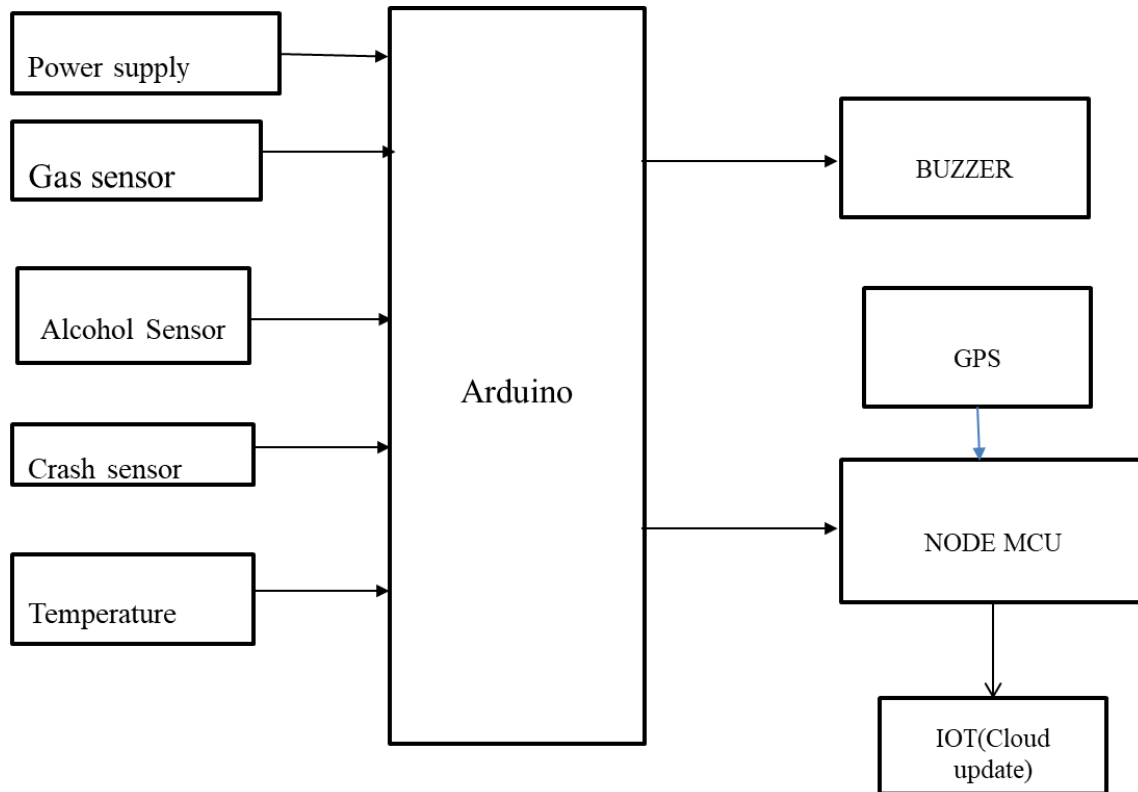


Fig 4.1 Block Diagram

4.3 WORKING PRINCIPLE

Most of the applications in the real time failed due to the over power consumption. In this Intelligent Vehicle Black Box using IoT, the controller for processing the sensors is consuming low power which opts for the real time applications. Different sensors are used for the safety of the driver and merchants are breath analyzer, accelerometer and ultrasonic sensor. When the driver exceeds his levels of alcohol consumption, immediately the message is sent to the owner or the contact of vehicle authority. Using the system, the driver will be alert condition, not performing such activities. The ultrasonic sensor records the distance of the surrounding vehicles alert the driver, when it is about to collide. After the collision, the accelerometer simultaneously knows the tilt values and send the message along with the location

using GSM and GPS. Push button is used to call out for help from the governance and the panic button is used to call help from the emergency contacts. The sensor values and location are sent to the cloud for the tracing purpose.

4.3.1 Data Collection

The IVBB gathers data from various sources within and around the vehicle. This can include:

- Internal Sensors: Sensors within the vehicle monitor parameters such as speed, acceleration, braking, engine RPM, fuel level, temperature, and more.
- External Sensors: Cameras, LiDAR (Light Detection and Ranging), radar, and GPS (Global Positioning System) receivers capture information about the vehicle's surroundings, including road conditions, other vehicles, pedestrians, and obstacles.
- OBD-II Port: The On-Board Diagnostics (OBD-II) port provides access to diagnostic information from the vehicle's engine control unit (ECU), allowing the IVBB to monitor engine performance and detect faults.

4.3.2 Data Transmission

The collected data is transmitted in real-time or periodically to a centralized server or cloud platform via wireless communication protocols such as Wi-Fi, cellular networks (3G/4G/5G), or satellite communication. This enables remote monitoring and analysis of vehicle behavior.

4.3.3 Data Storage and Analysis

The transmitted data is stored securely in a centralized database for further analysis. Advanced algorithms and machine learning techniques may be employed to process the data and extract meaningful insights regarding the vehicle's performance, driver behavior, road conditions, and potential safety hazards.

4.3.4 Event Detection and Alerts

The IVBB continuously monitors the incoming data for critical events such as accidents, harsh braking, sudden acceleration, lane departures, and deviations from predefined safety parameters. When such events occur, the system generates alerts in real-time, notifying relevant stakeholders such as the driver, fleet manager, or emergency services.

4.3.5 Remote Access and Control

Authorized users can remotely access the IVBB data and control certain vehicle functions through a web-based dashboard or mobile application. This enables fleet managers to track vehicle locations, monitor driver behavior, optimize routes, schedule maintenance, and improve overall operational efficiency.

4.3.6 Compliance and Reporting

The IVBB may also facilitate regulatory compliance by automatically generating reports and logs of vehicle activities, ensuring adherence to safety standards and legal requirements.

CHAPTER 5

IMPLEMENTATION AND ANALYSIS

5.1 HARDWARE DESIGN

5.1.1 ARDUINO UNO AND ITS PROGRAMMING

Arduino is a tool for making computers that can sense and control more of the physical world than your desktop computer. It's an open-source physical computing platform based on a simple microcontroller board, and a development environment for writing software for the board.

Arduino can be used to develop interactive objects, taking inputs from a variety of switches or sensors, and controlling a variety of lights, motors, and other physical outputs. Arduino projects can be stand-alone, or they can be communicate with software running on your computer. The boards can be assembled by hand or purchased preassembled; the open-source IDE can be downloaded for free.

The Arduino programming language is an implementation of Wiring, a similar physical computing platform, which is based on the Processing multimedia programming environment.

5.1.2 Arduino Uno:

However, the 5V pin may supply less than five volts and the board may be unstable. If using more than 12V, the voltage regulator may overheat and damage the board. The recommended range is 7 to 12 volts.

The power pins are as follows:

- VIN. The input voltage to the Arduino board when it's using an external power source (as opposed to 5 volts from the USB connection or other regulated power source). You can supply voltage through this pin, or, if supplying voltage via the power jack, access it through this pin.

- 5V.

This pin outputs a regulated 5V from the regulator on the board. The board can be supplied with power either from the DC power jack (7 - 12V), the USB connector (5V), or the VIN pin of the board (7-12V). Supplying voltage via the 5V or 3.3V pins bypasses the regulator, and can damage your board.

- 3V3.

A 3.3 volt supply generated by the on-board regulator. Maximum current draw is 50 mA.

- GND.

Ground pins.

- IOREF.

This pin on the Arduino board provides the voltage reference with which the microcontroller operates. A properly configured shield can read the IOREF pin voltage and select the appropriate power source or enable voltage translators on the outputs for working with the 5V or 3.3V.

- Memory

The ATmega328 has 32 KB (with 0.5 KB used for the bootloader). It also has 2 KB of SRAM and 1 KB of EEPROM.

5.2 INPUT AND OUTPUT

Each of the 14 digital pins on the Uno can be used as an input or output, using `pinMode()`, `digital Write()`, and `digital Read()` functions. They operate at 5 volts. Each pin can provide or receive a maximum of 40 mA and has an internal pull-up resistor (disconnected by default) of 20-50 kohms. In addition, some pins have specialized functions

- Serial: 0 (RX) and 1 (TX). Used to receive (RX) and Transmit (TX) TTL serial data. These pins are connected to the corresponding pins of the ATmega8U2 USB-to- TTL Serial chip.

- External Interrupts: 2 and 3. These pins can be configured to trigger and interrupt on a low value, a rising or falling edge, or a change in value. See the attach Interrupt () function for details.
- PWM: 3,5,6,9,10, and 11. Provide 8-bit PWM output with the analog Write () function
- SPI:10(SS), 11(MOSI),12(MISO),13(SCK). These pins support SPI communication using the SPI library.
- LED: 13. There is a built- in LED connected to digital pin 13. When the pin is HIGH value, the LED is on, when the pin is LOW, it's off. The Uno has 6 analog inputs, labeled A0 through A5, each of which provide 10 bits of resolution (i.e. 1024 different values). By default they measure from ground to 5 volts, though is it possible to change the upper end of their range using the AREF pin and the analog Reference () function. Additionally, some pins have specialized functionality:
- TWI: A4 or SDA pin and A5 or SCL pin. Support TWI communication using the Wire library.

There are a couple of other pins on the board:

- AREF. Reference voltage for the analog inputs. Used with analog Reference ().
- Reset. Bring this line LOW to reset the microcontroller. Typically used to add a reset button to shields which block the one on the board.

5.3 Communication

Microcontrollers depend on a host computer for developing and compiling programs. The software used on the host computer is known as an integrated development environment, or IDE. For the Arduino, the development environment is based on the open source Processing platform (www.processing.org) which is described by its creators as a “programming language and environment for people who want to program images, animation, and interactions.” The Arduino programming language leverages an open source project known as Wiring (wiring.org.co). The Arduino language is based on good old- fashioned C. If you are unfamiliar with this language, don’t worry; it’s not hard to learn, and the Arduino IDE provides some feedback when you make mistakes in your programs.

The Arduino Uno has a number of facilities for communicating with a computer, another Arduino, or other microcontrollers. The ATmega328 provides UART TTL (5V) serial communication, which is available on digital pins 0 (RX) and 1 (TX). An ATmega16U2 on the board channels this serial communication over USB and appears as a virtual com port to software on the computer. The '16U2 firmware uses the standard USB COM drivers, and no external driver is needed. However, on Windows, a file is required. The Arduino software includes a serial monitor which allows simple textual data to be sent to and from the Arduino board. The RX and TX LEDs on the board will flash when data is being transmitted via the USB-to-serial chip and USB connection to the computer (but not for serial communication on pins 0).

As you go through the list of programming statements available in the Arduino IDE (choose Help->Reference), you might think there isn't much power for doing things like running servos, operating stepper motors, reading potentiometers, or displaying text on an LCD. Like most any language based on C, the Arduino supports the notion of "libraries" code Repositories that extend core programming functionality. The standard Arduino software installation comes with several libraries you may use, and you can download others from the Arduino support pages and from third-party websites that publish Arduino library code.

5.4 WHY ARDUINO?

There are many other microcontrollers and microcontroller platforms available for physical computing. Parallax Basic Stamp, Netmedia's BX-24, Phidgets, MIT's Handyboard, and many others offer similar functionality. All of these tools take the messy details of microcontroller programming and wrap it up in an easy-to-use package. Arduino also simplifies the process of working with microcontrollers, but it offers some advantage for teachers, students, and interested amateurs over other systems:

Inexpensive-Arduino boards are relatively inexpensive compared to other microcontroller platforms. The least expensive version of the Arduino module can be assembled by hand, and even the pre-assembled Arduino modules cost less than \$50

Cross-platform - The Arduino software runs on Windows, Macintosh OSX, and Linux operating systems. Most microcontroller systems are limited to Windows.

Simple, clear programming environment - The Arduino programming environment is easy-to-use for beginners, yet flexible enough for advanced users to take advantage of as well. For teachers, it's conveniently based on the Processing programming environment, so students learning to program in that environment will be familiar with the look and feel of Arduino. Open source and extensible software- The Arduino software is published as open source tools, available for extension by experienced programmers. The language can be expanded through C++ libraries, and people wanting to understand the technical details can make the leap from Arduino to the AVR C programming language on which it's based.

5.5 SENSORS

5.5.1 TEMPERATURE SENSOR

A temperature sensor is a device that measures the temperature of its surroundings and converts it into a readable output, typically in the form of an electrical signal. Temperature sensors come in various types, each utilizing different principles to measure temperature accurately.



Fig 5.1 Temperature sensor

5.5.2 GAS SENSOR

A gas detector is a device that detects the presence of gases in an area, often as part of a safety system. A gas detector can sound an alarm to operators in the area where the leak is occurring, giving them the opportunity to leave.



Fig 5.2 Gas sensor

5.5.3 VIBRATION SENSOR

A vibration sensor is a device that measures the amount and frequency of vibration in a given system, machine, or piece of equipment. Those measurements can be used to detect imbalances or other issues in the asset and predict future breakdowns.



Fig 5.3 Vibration sensor

CHAPTER 6

RESULTS AND CONCLUSION

6.1 RESULT

- When vehicle battery turn-on all the sensors continue to work. When vehicle ignition turned on registered mail address.
- gas and crash sensors send readings to the mobile device with If the threshold amount of gas is exceeded which means the driver or other toxic gas is pumped into the vehicle.
- Switch off the power engine and take an image, then send it to the mail, submit it to SMS with position coordinates gas sensor reading.

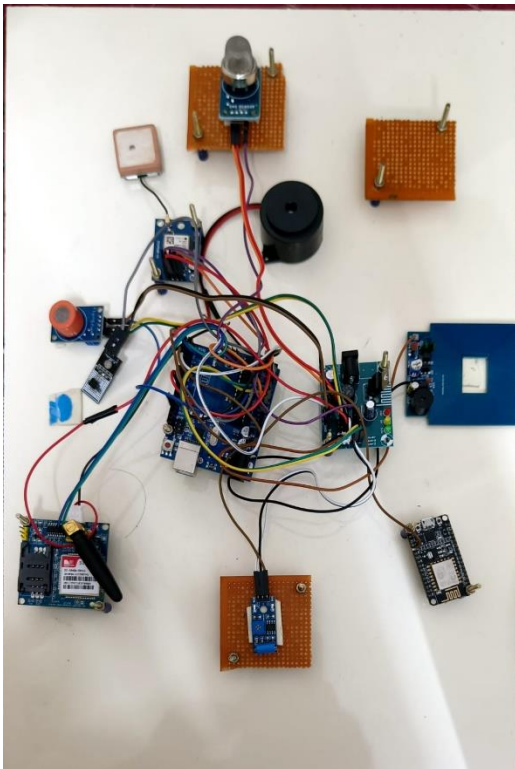


Fig 6.1 Result

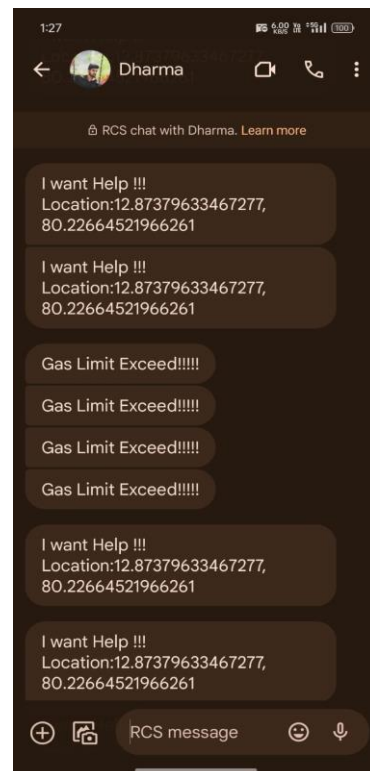


Fig 6.2 Result

6.2 CONCLUSION AND FUTURE SCOPE

Setting up a postal contact and creating a black box to transfer data and pictures using the Internet of Things and using a webcam to figure out who took the vehicle by getting their snapshot while taking vehicle and data to find the vehicle if the vehicle is stolen using GPS coordinates. When the crash has happened, give the details of the sensor with the coordinates to the ambulance squad to save their lives. Additionally, the key system to provide coordinates with the position and speed of the vehicle in a smartphone device.

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 Em-bedded 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 the hardware along with a rechargeable battery and can serve the device in a longer period.

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