



Design and implementation of Black Box for accident detection and live vehicle tracking using GSM and GPS systems based on IOT technology for normal vehicles without internet .

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Abstract—The main purpose of the paper is to develop a prototype of Black Box for vehicle diagnosis that can be installed into any vehicle . Like flight data recorders in aircraft “Black Box “ technology plays a key role in vehicle crash investigations .This prototype can be designed with minimum number of circuits . This can be contribute to construct safer vehicles , improving the treatment for crash victims , helping insurance companies with their vehicle crash investigations , and enhancing road status in order to decrease the death rate . The prototype provides complete information about the car along with Navigation system in collaboration with Google Map . The prototype can provide Artificial Intelligence Support by having a communication channel between the user and the car or bike .

Keywords—Black Box; Google Map; Artificial Intelligence; Global Positional Society.

I. INTRODUCTION

According to the World Health Organization , more than a million people in the world die each year because of transportation - related

accidents . In order to react to this situation the black box system draws the first step to solve problem . Like flight data recorders in aircraft ,“Black Box “technology can now play a key role in motor vehicle crash investigation

A significant number of vehicles currently on the roads contain electronic systems that record 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 . Subjective input that is taken usually from victims eye witnesses and police reports . This system is mainly committed to three sections . The first one is how to detect and collect the information from the vehicle . The second is how to present the data to the user in a simplified way . The most important is the third one , where the information related to abruptness and rashness

in the driving skills of the driver are transmitted from one vehicle to another using

Radio Frequency and suitable Transceivers . To measure the inclination of the vehicle as well as measuring the tilting and analyzing the speed of the vehicle , basically a Vehicle Dynamics Control Unit there are G-sensors used in the vehicle which are connected to the microcontroller . C programming is being used to interface all the sensors on the Arduino Board as it provides great efficiency to the microcontroller . This programming helps in not only recording the data but also retrieving the data from microcontroller memory to an LCD to display it .

In this project , the traditional version of Black Box is replaced by a newer technology i.e. the traditional black box used a OBD –II cable for diagnostics of the vehicle whereas the current version of Black Box uses sensors connected to the microcontroller giving you better and more information about the vehicle along with the On –board Diagnostics cable .

The applications of Car Black box include :

1. Better crash research that may produce improved driver education programs , safer road designs and improve highway safety .
2. Collision data for research , data to improve vehicle design internally and externally .
3. To not only record the relevant data , but also try and prevent a possible collision by limiting the speed of the vehicle in accident prone areas .
4. Wireless communication by transmission of alert message in the event of a collision along with the time and location co – ordinates through GSM .

II . LITERATURE SURVEY

The entire designed system is valuable for the avoidance of accident . The Car Crashes Record Office (ACRO) a NGO in Geneva announced that there are about 236 flight accidents all over the world from 1999-2013 ensuing in a death toll of 18,987 when flights meet disaster in mid air . The reason of the accidents is not known instantly . Teams are dispatched in complicated

condition to recover the aviation data recorder also called as Black Box . Untill the Black Box is found the exact reason of the crash cannot be firm . At times it may take years to find the black box ,. For ex. Air France flight 447crashed into the Atlantic ocean on June 1, 2009 . The reason of the accident was unidentified mainly because of the black box was missing . It was found after almost two years later in May 2011 . It is vital to note that the delay in finding flight data recorder creates hazard for future flights . If the flight data is transmitted into real time to ground using CC2500 in adding to being saved in the black box the data would be obtainable immediately in case of crash .Today’s the Black Box is still as vitally significant in helping piece together the reason of a plane crash , as seen by the innovation of the black box in the Mexico on 4th November , 2008 . The first demonstration unit was formed in 1957 , but it was not until 1960, after an unsolved planr crashed in Queensland , that Australia became the initial country in the world to construct the black box compulsory for all commercial aircraft .

III . EXISTING SYSTEM

Consider the situation that a car is met with an accident in the middle of highway and there is no immediate assistance

from anybody nearby . If any injury happened to the car driver or passengers may be there will be loss of lives due to delay in medical help . Keeping this idea in our mind , we are proposing a system where car itself intimates the concern emergency service for immediate reaction in case of accident or any emergency situation . The system we are developing is very useful in case of above mentioned scenario . If a vehicle met with an accident then the system will automatically active itself but it will wait for one minute for user response . In case of user is OK and situation is under control then the user deactivate the system manually . In case of serious problem then the system will send the message to the registered mobile numbers along with the geographical position of the incident after one minute . The coordinates send by the system will help to find out the exact position of the vehicle on globe so that the emergency services will track the vehicle and can help with minimum amount of time .

Now consider the one more scenario where we are working in the office at high floor or

watching the movie at cinema hall etc. means we are away from our vehicle and a vehicle thief is trying to thief our car which is already fitted with security system which only prompt with a sound alert which is not possible to hear at long distance . We are trying to develop the system where vehicle automatically inform the user via phone call directly on user's GSM phone . As soon as the thief tries to thief the vehicle , system will automatically make a phone call on user's phone . User will then take necessary action to save the vehicle . In this case , other people will not be harassed because of irritating sound created by sound alarm . Another advantage of system is that the user is always reachable by vehicle security system .

DESIGN CHALLENGES

The challenge of our project is to create a Black Box for car which will used to find the exact location of car . Consider the situation that a car is met with an accident in the middle of highway and there is no immediate assistance from anybody nearby . If any injury happened to the car driver or passengers so maybe there will be loss of lives due to delay in medical help. Keeping this idea in our mind , we are proposing a system where car itself intimates the concern emergency service for immediate reaction in case of accident or any emergency situation .

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from the vehicle and a vehicle thief is trying to thief our car which is already fitted with security system which only prompt with a sound alert which is not possible to hear long distance .

IV.PROPOSED SYSTEM

The proposed system is an upgraded version of the Black Box designed earlier .The earlier box consisted diagnostics elements like Microphone and Camera for detection of any failure in the vehicle

The upgraded version has sensor based activation with the programmable board along with the Diagnostics Cable put inside a single box allowing the user to configure and detect the malfunctioning in the vehicle system and navigate through roads and paths by tracking through a mass platform Google Earth. The newer version of Black Box offers a user friendly program with safe navigation by letting the driver know the details of the vehicle approaching the driver by communication through transceivers which are sending and receiving the signals as soon as a threshold is crossed . This ensures safety to user .

DESIGN AND FUNCTION OF PROPOSED PROTOTYPE

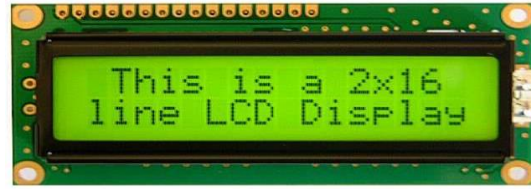
The basic and main purpose of the upgraded version of the black box is to provide complete data analysis along with fleet management to the user by giving detailed list of the parts working within the automobile and the functions in a simplified non technical language when the driver can identify and diagnose the wrong doings in the vehicle without him having the need to go to a mechanic where he is charged a huge amount for a simple malfunctioning

HARDWARE RESOURCES

A . Microcontroller:

Microcontroller as the name suggests , are small controllers .They are like single chip computers that are often embedded into other systems to function as processing or controlling unit . Here we are using AVR AT Mega 328 microcontroller based on Arduino platform . The microcontroller is programmed using the

Arduino programming language (based on wiring)and the Arduino development environment (based on processing) .



PIN DIAGRAM

Arduino function	Pin	Arduino function	Pin
reset	(PCINT14/RESET) PC6 1	PC5 (ADC5/SCL/PCINT13)	analog input 5
digital pin 0 (RX)	(PCINT16/RXD) PDD0 2	PC4 (ADC4/SDA/PCINT12)	analog input 4
digital pin 1 (TX)	(PCINT17/TXD) PD1 3	PC3 (ADC3/PCINT11)	analog input 3
digital pin 2	(PCINT18/INT0) PD2 4	PC2 (ADC2/PCINT10)	analog input 2
digital pin 3 (PWM)	(PCINT19/OC2B/INT1) PD3 5	PC1 (ADC1/PCINT9)	analog input 1
digital pin 4	(PCINT20/XCK/T0) PD4 6	PC0 (ADC0/PCINT8)	analog input 0
VCC	VCC 7	GND	GND
GND	GND 8	AREF	analog reference
crystal	(PCINT6/XTAL1/TOSC1) PB6 9	AVCC	VCC
crystal	(PCINT7/XTAL2/TOSC2) PB7 10	PB5 (SCK/PCINT5)	digital pin 13
digital pin 5 (PWM)	(PCINT21/OC0B/T1) PD5 11	PB4 (MISO/PCINT4)	digital pin 12
digital pin 6 (PWM)	(PCINT22/OC0A/AIN0) PD6 12	PB3 (MOSI/OC2A/PCINT3)	digital pin 11(PWM)
digital pin 7	(PCINT23/AIN1) PD7 13	PB2 (SS/OC1B/PCINT2)	digital pin 10 (PWM)
digital pin 8	(PCINT0/CLKO/ICP1) PBD0 14	PB1 (OC1A/PCINT1)	digital pin 9 (PWM)

C . GSM Module

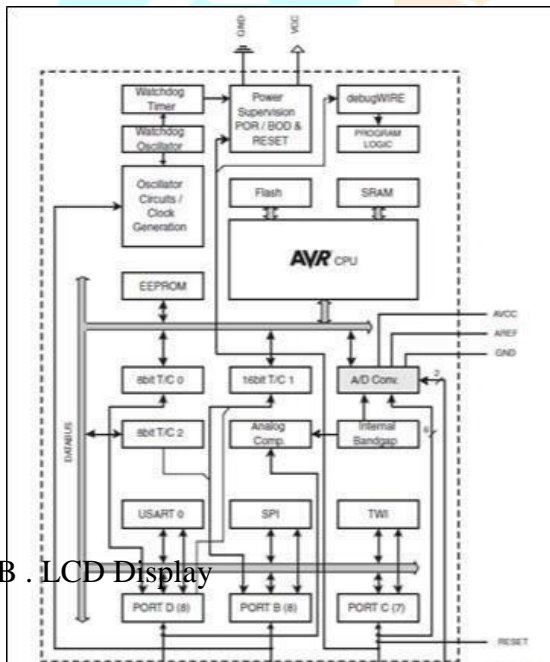
GSM(Global system for mobile) / GPRS (General packet radio service) TTL modem SIM900 quad band GSM / GPRS device , works on frequencies 850 MHZ and 1900 HZ . It is very compact in size and easy to use as plug in GSM modem .

DIAGRAM OF GSM CONNECTION SYSTEM

D . GPS Module

The Global Positioning system is a satellite based navigation system made up of a network of 24 satellites placed into orbit by the U.S. Department of Defence . GPS was originally intended for military applications , but in the 1980s, the government made the system available for civilian use . GPS works in any weather conditions , anywhere in the world , 24 hours a day. There are no subscription fees or setup charges to use GPS .

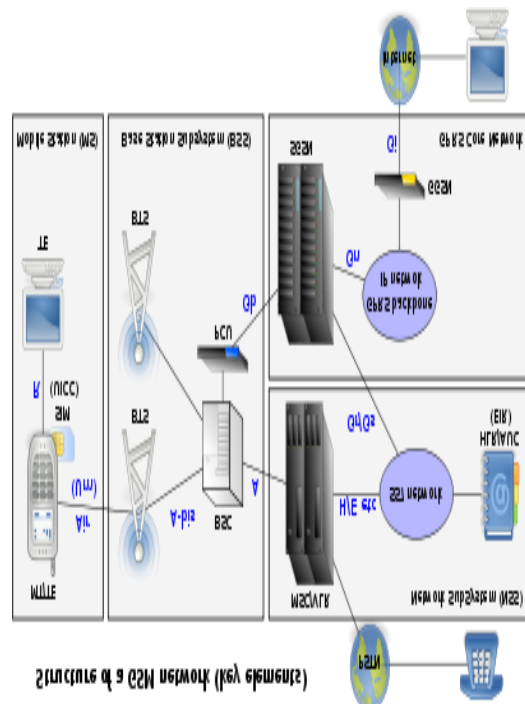
BLOCK DIAGRAM

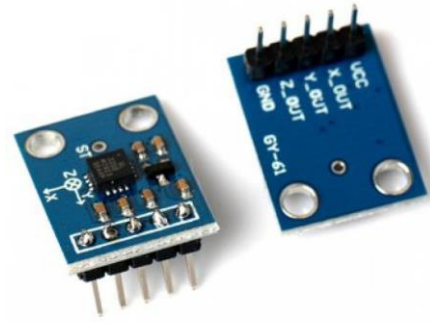
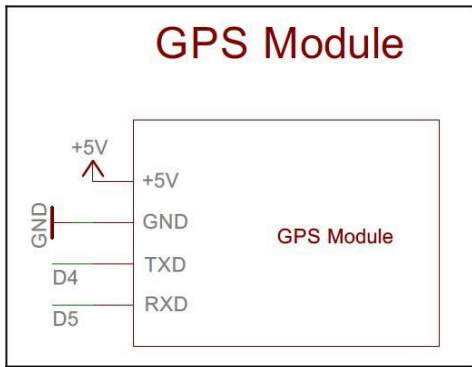


B . LCD Display

A liquid crystal display (LCD) is a thin , flat electronic visual display that uses the light modulating properties of liquid crystals (LCs) . LCs does not emit light directly . They are used in a wide range of applications including computer monitors , television , instrument panels , aircrafts cockpit displays , signage . Its low electrical power consumption enables it to be used in battery powered electronic equipment .

PIN DIAGRAM





CIRCUIT DESCRIPTION

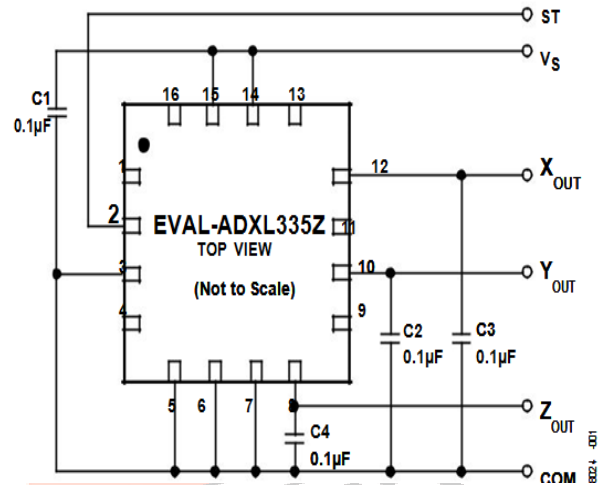
E. Three Axis Accelerometer

The EVAL – ADXL335Z is a simple evaluation board that allows quick evaluation of the performance of the ADXL335 three – axis accelerometer . The EVAL – ADXL335Z has a 6 – pin , 0.1 inch spaced header for access to all power and signal lines that the user can attach to a prototype board or wire using a standard plug. Four holes are provided for mechanical attachment of the EVAL-ADXL335Z to the application .

Three axis accelerometer is being pictured below accordingly . The basic function is to control and co ordinate the entire working function of the system .

It possess several small sized chips and pins connected to the board surface for the smooth functioning Each pin is meant for particular purpose .

The below diagram represents the hardware structure of the three axis accelerometer .



SOFTWARE FUNCTIONS

A . Arduino IDE

The Arduino IDE is a cross – platform application written in Java , and is derived from the IDE for the processing programming language and the wiring project . It is designed to introduce programming tp artists and other newcomers unfamiliar with software development . It includes a code editor with features such as high lighting , brace matching and automatic indentation , and is also capable of compiling and uploading programs to the board with a single click .

Key features

1. Cross platform program .
2. Open source .
3. Different instructions for different OS .
4. Example programs .

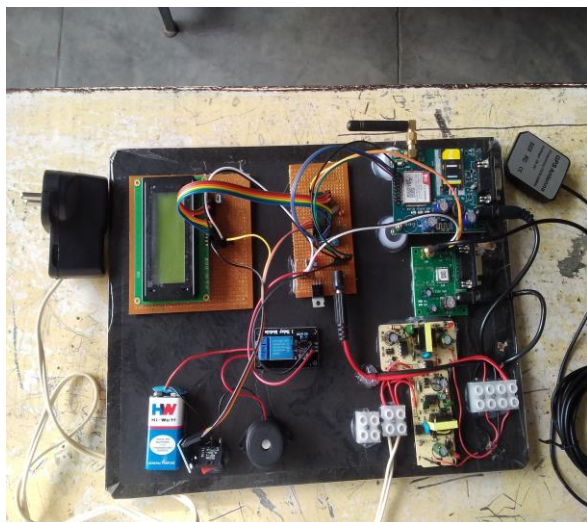
Blink Program

Once we have downloaded the Arduino IDE , we can plug the Arduino to our PC via USB cable . We are actually ready to “ burn “ our first program on the Arduino board . To select “blink led “ , the physical translation of the well known programming “hello world “, select File>Sketchbook >Arduino-0017>ExamplesDigital.Blink

Once we have our sketch we will see something very close to the screenshot on the following page . Thus we have come across the results to be obtained .

V . RESULTS

Our project becomes successful in detecting the accidents and thus taking necessary measures on basis of the GPS and GSM modules along with the accelerometer operations . It transfers the message to the corresponding mobile number which is connected along with the location of the accidents within several minutes . Thus it prevents severe effects of the accidents which can even destroy the human life .



VI . CONCLUSION

This paper has presented a new vision for the automobile industry . The use of Black Box system for vehicle diagnosis is a pitch capable to revolutionaries the way a layman visualizes his particular vehicle . Full and detailed description was made for every part of the system . This paper also offers a user friendly embedded program to analyze the data 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 begin saving the events and displaying the required details on the LCD screen of the corresponding vehicle . The highlight of the prototype is the ability to communicate with another vehicle approaching it by transmitting the values of speed and RPM of the automobile for safety purposes and alarming the user for abruptness in the driving

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Blink
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Turns on an LED on for one second, then off for one second, repeatedly.

// the setup function runs once when you press reset or power the board
void setup() {
  // initialize digital pin LED_BUILTIN as an output.
  pinMode(LED_BUILTIN, OUTPUT);
}

// the loop function runs over and over again forever
void loop() {
  digitalWrite(LED_BUILTIN, HIGH); // turn the LED on (HIGH is the voltage level)
  delay(1000); // wait for a second
  digitalWrite(LED_BUILTIN, LOW); // turn the LED off by making the voltage LOW
  delay(1000); // wait for a second
}
  
```

system of the approaching vehicle .

VII. FUTURE ENHANCEMENTS

We enhance the present system to check other parameters like fuel level , tire pressure and working of headlights before starting the vehicle . Many other critical parameters can be read and stored in the memory . Another useful add – on to the present system could be cameras on front and backsides which keep recording live images and storing them in memory . This video data would be much useful for accident investigation

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