Automotive Vehicle Event Recorder As Black Box

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Abstract- Automotive electronics plays a significant role in the automobile industry and provide luxurious features and more importantly addresses the safety and security concerns..The paper presents an integrated design with the basic features of data recorder which could be very useful for domestic vehicles and also hosts several additional features that could assist in mitigating the number of accidents. This system also provides automatic accident notification system which helps in informing the nearest hospital and the traffic authority by providing coordinates of the accident location for immediate medical attention which can save numerous lives every day.

Keywords: Blackbox, Arduino, Tracking, alerting, GPS, GSM.

I. INTRODUCTION

Internet of Things is a well-established technology for optimizing the traffic congestion and improving safety and secured transportation. The increase in number of automobile is difficult to solve the problems related to automobile accidents and hazards. The transportation is associated with high maintenance costs, disasters, accidents, injuries and safety. The road Accidents have crossed level above the expectations which result in human loss and road disasters every year. In order to record and manage enough vehicle driving information to provide necessary evidence in a traffic dispute, the intelligent driving recorder becomes more widely used. Application for tracking vehicle in real time and information exchange about the events is highly required in this modern era. Hence an advanced IOT based automatic event detector system is proposed and designed for the purpose of monitoring the vehicles which are moving from one place to other in order to provide safe and secured transportation. This system includes GPS and GSM module with sensors which is embedded within each vehicle that provides effective real time location and additional information. The system includes the hardware and the software components that collects various data and transfer to admin through SMS. These data are stored in black box which will serve as an analysis tool to prevent future accidents. Accident data collected by the black box could be used to identify the most dangerous intersections in the cities. With the collected data necessary actions could be taken which will create a greater impact in transportation. This system aims at providing a cost effective solution to the design and development of an event data recorder which has been basically adopted from the aviation sector considering the need and the correlated benefits.

II. LITERATURE REVIEW

The proposed system is developed for automobile monitoring purpose. The protocols used in this work is ZigBee protocols. The GPS module is used instead of conventional speedometer and also embedded with sensors. Main purpose of this system is the vehicle to vehicle communication for Lane clearance during the emergency situations which would save human life. These information are displayed in the LCD[1].The vehicle tracking system is technology that is used by many companies to monitor and track a vehicle by using many ways like GPS. This system operates using satellites and ground based stations or by using other approaches which depends on the cellular mobile towers. The system is embedded using Raspberry pi which is connected to a 3G/4G dongle that is used as a modem. The main benefit of vehicle tracking system is the security purposes by tracking the vehicle's location. The information are sent to the police center as an coordinates. When a police center receives an alert for stolen vehicles, the necessary action are taken to prevent this theft [2].The proposed system exercise the contemporary technology by means of embedded C programming language and the unit developed thorough LPC2148 and its sophisticated features of storing database. GPRS sense the tracking information to the server and send an alert message which is transmitted to the owner of the vehicle. This system is deployed in the interior of the vehicle whose location is to be determined on the web page and supervised at real time. Hence if the driver drives the vehicle on the wrong path then the alert message will be sent from the integrated system to the vehicle's owner mobile. This system also take care of the traveller's safety by using alcohol sensor to find the status of the driver and temperature sensor to monitor vehicle engine temperature to avoid sparking of vehicle their by preventing from the

disaster[3].The main concentration of this project is to find out the vehicle which is met with an accident by using MEMS sensor and GPS, GSM. ARM controller communicates with LCD,GPS module and GSM modem. This system will be placed in every vehicle. The ARM controller when interfaced with GPS module the system gets activated and sends the vehicle location information to central station over GSM network.Whenever any accident occurs the vibration and external mechanical force is detected by the MEMS sensor and transmitted to ARM controller, by using GPS the particular location can be determined where accident occurs, and then GSM sends message to authorized members & emergency numbers[4]. The project is based on security of a vehicle by tracking its location. The proposed system also has the feature of automatically slowing down the vehicle speed and also includes a voice output for the particular zones to alert the driver[5]. The vehicle monitoring system is based on various sensors like alcohol sensor, speed detection sensor, seat belt sensor, eye blink sensor. The sensors are used to detect various parameters and the information will be frequently updated in a webpage which is monitored by the authorized person[6].The system is an implementation of vehicle management system. The microcontroller used is TI MSP430F5438.The processor in embedded with GPS,GPRS and SD card storage which is used to monitor vehicles in real time. The data collected are stored in the SD card which can be used for future analysis[7].

III. PROPOSED SYSTEM

The proposed system combines the installation of an electronic device in a vehicle with purpose designed software to allow the admin to monitor the vehicle in real time, collecting data in the process from the field and deliver it to the base of operations immediately so that necessary actions would be taken. The vehicle parameters such as engine temperature, fuel level, vehicle distance and speed are continuously monitored and the data are stored in the memory card stored in the black box.

The location can be obtained by interfacing the GPS and GSM module. The These data are continuously sent as SMS to the admin which helps to easily monitor the vehicle. It also alerts the driver in case of obstacle detected. It makes possible for the user to communicate with the system wirelessly.
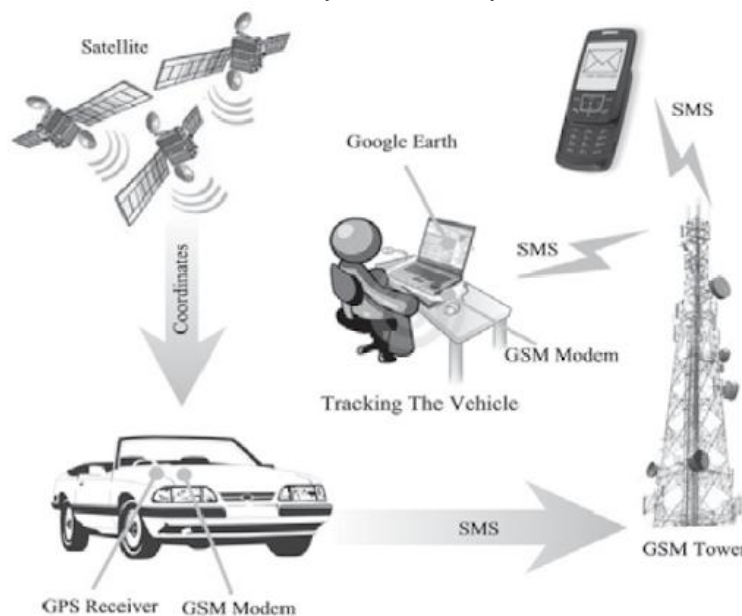
IV. HARDWARE INTERFACES

4.1 Arduino Mega
The Arduino MEGA ADK is a microcontroller board based on ATmega2560. Arduino MEGA can be powered via the USB connection or with an external power supply.

4.2 Gps Module
GPS module is the main component in our vehicle monitoring and alerting system. This device is attached to each vehicle. GPS module receives the coordinates from the satellite for each and every second with time and date. GPS module sends the vehicle location to the admin in case of accidents.

4.3 Gsm Module

GSM module is used to establish communication between the application and the GPS system. It sends an alerting SMS to the admin and the nearby hospital in case of accidents.

4.4 Ultrasonic Sensor

We have used two types of ultrasonic sensors here .The first ultrasonic sensor is used to measure distances. It can measure 2cm to 400cm of non-contact measurement functionality with a ranging accuracy that can reach up to 3mm.It uses sonar waves of echolocation, like bats, to be able to measure distance.
The second ultrasonic sensors is used to check the fuel level. It works by the "Time of flight" principle using the speed of the sound.

4.5 Crash Sensor

Crash sensors are used to detect a collisions and convert it into usable signals within milliseconds.

4.6 Sim Module

SIM module is a complete Quad-Band GSM / GPRS module which combines GPS technology for satellite navigation.

4.7 Gps Antenna

GPS signals are extremely weak and present unique demands on the antenna so the choice plays an important role in GPS performance. The antenna provides additional 28 dB of gain.

4.8 Gsm Antenna

The antenna is what allows communication signals to be sent and received. The antenna that we have used in our project provides operation at both GSM Quad Band Frequencies.

V. EXPERIMENTAL RESULTS

The work includes Global Positioning System (GPS) and Global System Mobile Communication (GSM) for vehicle tracking and monitoring using SIM module. It also includes various sensors like ultrasonic sensor, crash sensor and temperature sensor to collect the additional information such as the fuel level, vehicle distance and engine temperature. The design is an embedded application, which will continuously monitor the moving vehicle and report the status of the vehicle through SMS to the admin. The modules are connected to the Arduino board with respect to their pin configurations .Initially Arduino is interfaced serially to a GSMmodem SIM and GPS receiver along with the sensors. When the Arduino is provided with the power supply, communication takes place. The message stored in the transmitter is displayed at the receiver in the serial monitor. The ultrasonic sensor is used to calculate the time interval between sending the signal and receiving the echo to determine the distance to an object that alerts the driver if the obstacle is close to the vehicle and thus helps in avoiding collisions during reverse gear by placing it on the rear bumper. It can also be placed on the front bumper to avoid collision in slow moving traffic. It is also used to measures the distance to the surface of the fluid hence an alert message in case of low fuel level. The crash sensors integrated to the system is used to detect a collision and convert it into usable signals within milliseconds. The sensors measure this acceleration and relay it to the control unit as usable data which intimate the admin and hospitals in case of any accidents so that necessary action can be taken. A fire sensor works by detecting smoke and heat. These devices respond to the presence of smoke or extremely high temperature that are present with a fire. After the system has been activated, it will send a signal to the alarm system to perform the programmed response for that zone. A GPS module that uses satellite technology for its navigation system which will continuously give the data that is the latitude and longitude which indicates the position of the vehicle and also calculates the speed. The GSM sends the tracking information to the server along with sensor details and thus the system automatically sends a reply to the mobile indicating the information of the vehicle to the administration through SMS. The Black Box saves all the data which are further utilized for future analysis of accidents. The block diagram of event recorder shows how the system works. This unit is installed inside the vehicle that is to tracked.
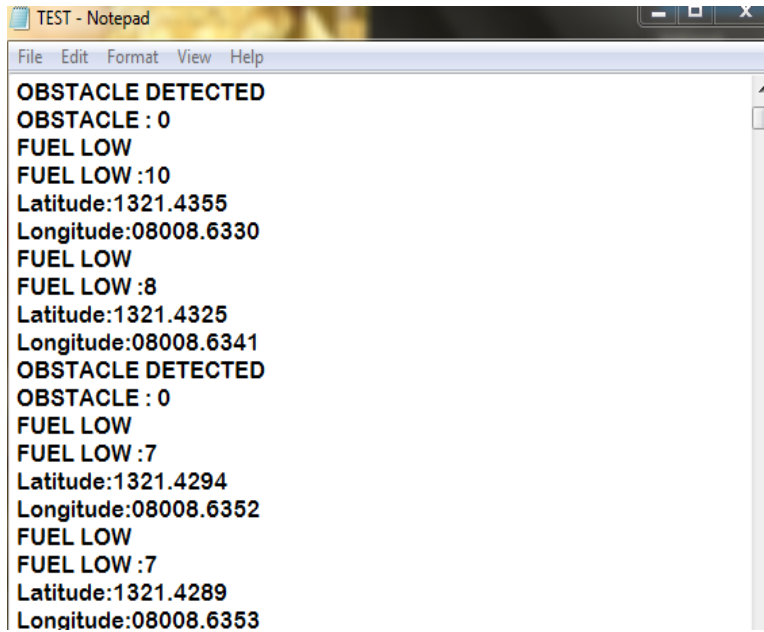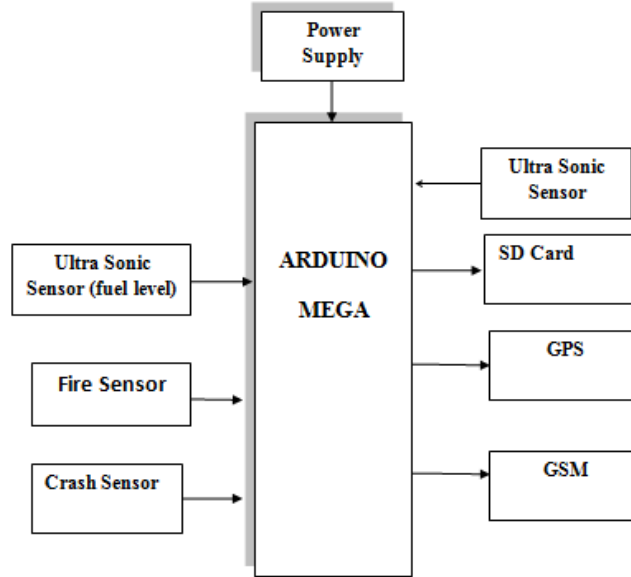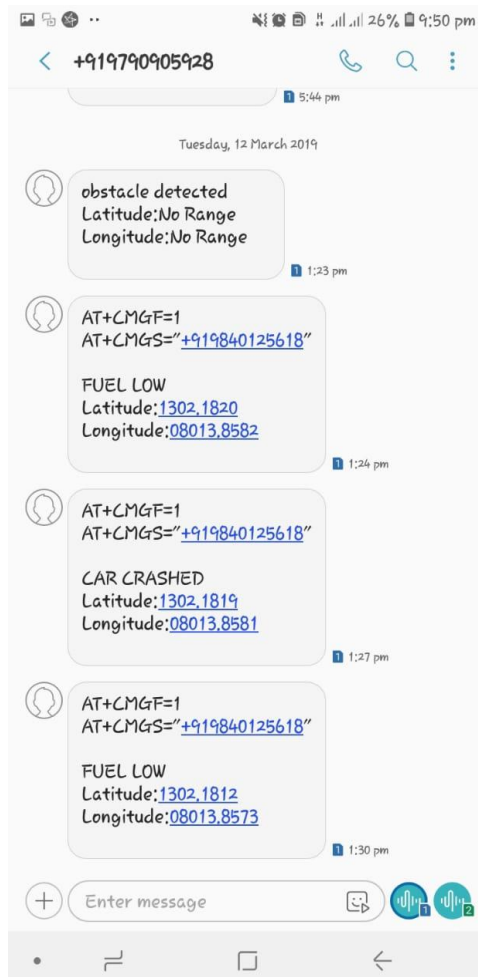
FIG. 1 The Block diagram of the integrated system

FIG. 2 The SMS which is received by the admin, it is output of the experiment.

FIG 3 Information stored in the SD card which is also displayed in the serial monitor

VI. CONCLUSION

We have developed a Automatic Event Detector system which is used to notify he accidents with exact physical locations to provide immediate medical attention thereby saving human lives. The Arduino is the brain of the system and GSM modem is controlled by AT commands which enable data transmission over GSM network. It can also prevent future accidents by analyzing the previous accidents. This method of monitoring vehicle performance, condition and movement is to obtain the better driving styles in order to safety and security of the traffic system. We can further think of commercialization of the system in future. Implementation of this system in public transport can certainly bring revolutionary change in developing countries.

VII. REFERENCES

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