Black Box for Automobiles

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***Abstract*— This paper presents a cost-effective methodology for obtaining the real-time data of an automobile and store it for future reference. It uses a Global Positioning System (GPS) module to recover the real-time geographical position and a Global System for Mobile Communications (GSM) module which allows the owner/user to receive the real-time location of the vehicle at the time of accidents in the form of short message service (SMS). The system also consists of various salient features such as the Ultrasonic Sensor, Vibration Sensor, and Temperature sensor that records the real-time parameters of the vehicle and helps for future investigation after accidents occur. The data received from the sensors and modules are logged in an SD card and the movement of the vehicle can be visualized using any GPS Visualizer like the google map.**

Keywords—GPS,GSM,NMEA

I. INTRODUCTION

The changing needs of society are always accompanied by challenges. To meet these challenges, we must innovate our technology every day to provide solutions to the problems we face. By society. This article describes an advanced and cost-effective vehicle system for monitoring Use GPS (Global Positioning System) for informational purposes without the involvement of a third party And GSM (Global System for Mobile Communications). The proposed system monitors the geographical location and speed of the vehicle through the GPS module and send your information to the owner via mobile phone in the form of a short message (SMS) via GSM The module must be at your request or after a predefined period of time. The system consists of a GPS module, a single chip microcomputer, and a GSM module. furthermore, the system also includes some notable features, including accident recognition through inertial sensors, The date and time pass through the RTC (real time clock), and the parking system passes through an ultrasonic sonar sensor (measurement The distance between the automatically parked vehicle and the obstacle) and the data is recorded on the SD card we can determine the trajectory of the vehicle and visualize its movement on Google Maps. The proposed system will provide solutions to the problems faced by vehicle owners (cars, trucks, etc.) During your travels.

Various papers propose different innovative method for vehicle monitoring. To meet the requirement of some intelligent vehicle monitoring system, a software integrated GPS and GIS, database and relay server is proposed [1] in which the TCP and UDP protocols is use for communication between the client and server. Another approach puts forward an overall scheme for vehicle monitoring system using GPS, GSM, GIS modules [2] with a function software at the monitoring centre based on MAPx platform. However, the need for database and specific monitoring software makes it expensive.

A different approach is proposed by integrating GPS and GSM/GPRS transmission technologies [3]. The basic idea is to localize the vehicle system by receiving the real time position of the vehicle through GPS and send the information through GSM module via SMS service with an added feature of GPRS transmission to the monitoring center through usage of internet. In this method it cannot function in the absence of internet. Another system is proposed using GPS and GSM modules for information in the public transportation [4]. The system comprises of GPS and GSM modules installed on public transportation which helps the passenger in order to get the information about the real time position of the vehicle (busses or taxi) through GPS and space available in the public transportation via GSM module as an SMS (Short Message Service) to the user mobile unit and also to the monitoring center .

The accuracy Of GPS signal for vehicle position and speed, and sending its information to monitoring center is tested in [5]. The real time data storage and information that can be displayed and also an audio alert can be generated which can be used for monitoring and diagnosing for vehicle security and safety is done by [6]. Another system proposed by [7] provides the efficient system that can be used for organizing stolen car cases, notify about the speed limit and can store data, information and accuracy about the vehicle [7]. A system that provides the information about the vehicle and can also navigate the vehicle through the use of internet is de-signed by [8]. A solution to traffic problem is provided by [9] using GPS and GIS technologies.

In this paper we proposed a cost-effective technique for monitoring and recording real time vehicle parameters for road safety and investigation purpose.

Methodology has the following objectives:

- To send information about the vehicle and live tracking via SMS.
- Vehicles real time parameters such as location, temperature, vibration is measured and location is sent through SMS to the predefined numbers and after a predefine time period at owner request.
- The main objective of the proposed work is to provide a user-friendly vehicle monitoring system using GPS & GSM modules.

II. PROPOSED WORK

A portable kit containing the brain (microcontroller) that controls the execution of operations GPS module, GSM module, RTC, vibration sensor and ultrasonic probe sensor are installed in the vehicle is shown in the block diagram in the picture. The GPS module is used here to receive real-time information. The position and speed of the vehicle are sent to the microcontroller in the form of an NMEA code, and then The microcontroller will decode the NMEA codes and send them to the GSM module, which will send The user sends the

real-time position and speed information of the vehicle to the user via SMS Defined time interval.

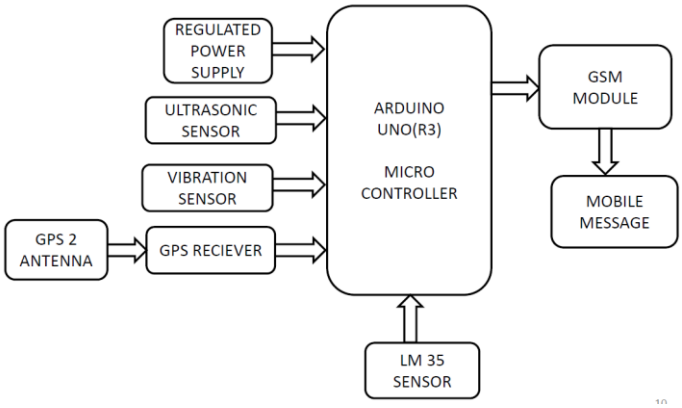


Fig 1: Block diagram

A. Sensing unit

Ultrasonic Sensor [HCSR04]

Ultrasonic sensors are used to measure the minimum distance to nearby vehicles. It measures distance by emitting sound waves of a specific frequency and monitoring the bounce of the sound waves. Remind the driver to avoid detecting obstacles and avoid vehicle collision. Its range is about 40 to 70Khz and its operating voltage is +5v.

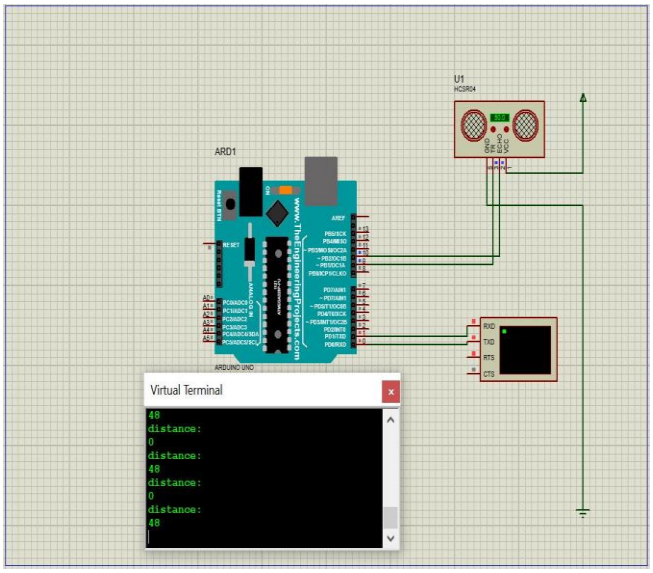


Fig 2: Simulation result of Ultrasonic Sensor

Vibration Sensor [LM393]

The vibration sensor detects the vibration caused by the car accident. Before installing the vibration sensor, it is extremely important to determine what level of vibration properly to activate the sensor just in case. Also, it is important to remember the unintended risks involved in activation caused by the earthquake, and there are construction traffic and other vibration reasons such that the sensor may be activated. The vibration module relies on LM393 comparator to detect if there is any vibration that exceeds the threshold. The threshold can be adjusted by onboard potentiometer. When there is no vibration, the module generates low logic Signal indicator LED lights and vice versa. It has 3pins that is Vcc, GND and an output pin which will be connected to Arduino. The operating voltage is 5V.

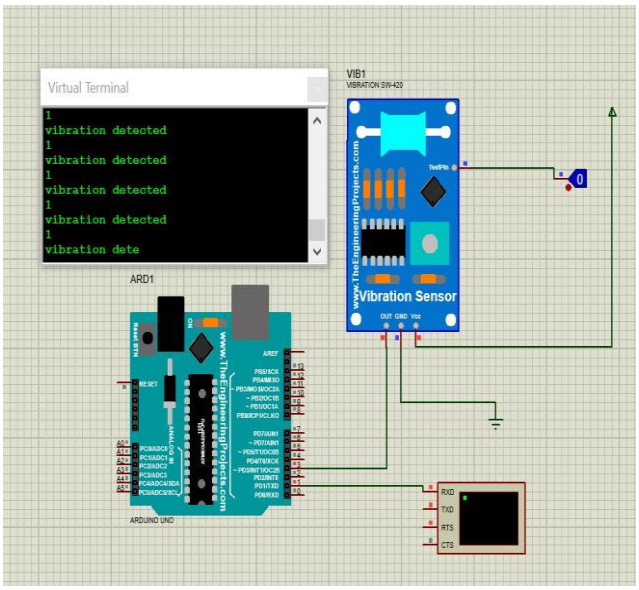


Fig 3: Simulation result of Vibration Sensor

Temperature Sensor [LM 35]

The LM35 series are called precision integrated circuits temperature sensor, its output voltage is linear. It is proportional to the temperature in degrees Celsius (Centigrade). This therefore, LM35 has an advantage over linear temperature. Sensors calibrated in degree Kelvin, because users do not need to subtract a large constant voltage from its output to get practical Celsius scale. It has 3pins Vcc, GND and output pin which will be connected to Arduino. A voltage of 4-20v is given as input to Vcc.

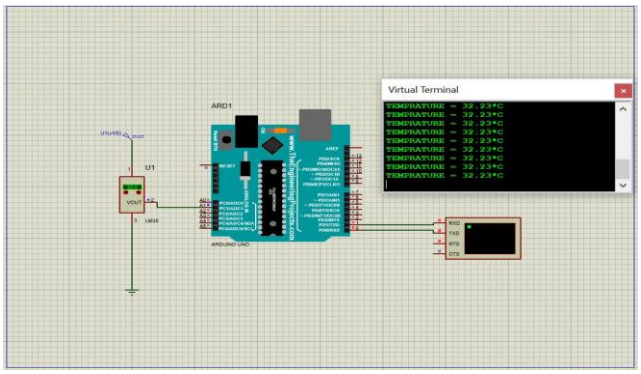


Fig 4: Simulation result of Temperature Sensor

B. Processing unit

Arduino Uno R3

It is an 8-bit microcontroller based on the ATmega328 is used in the proposed system for communication between GPS and GSM module and to accept real-time data from the various sensors.

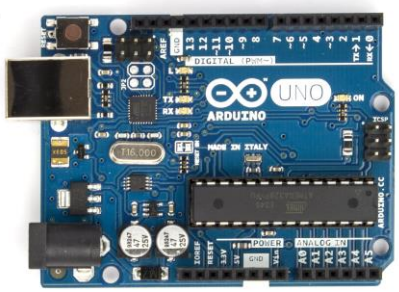


Fig 5: Arduino uno R3

C. Location detection

Global Positioning System (GPS) SKG13BLmodule is used for recovering the current location of the vehicle at real-time that hast to be communicated to the user/owner/registered phone numbers at the time of accidents. It receives location information from the satellite using an NMEA protocol called $GPGGA and communicates with the Microcontroller using UART through RX and TX pins.

Data communication

Global System for Mobile Communications (GSM) SIM800A based on LM7805 IC is used in the proposed system in order to communicate the location data to the user. The real-time location data received from the GPS module is sent to the registered user via SMS. This information is sent in the form of link that can be directly opened in a GPS visualizer (Google map).

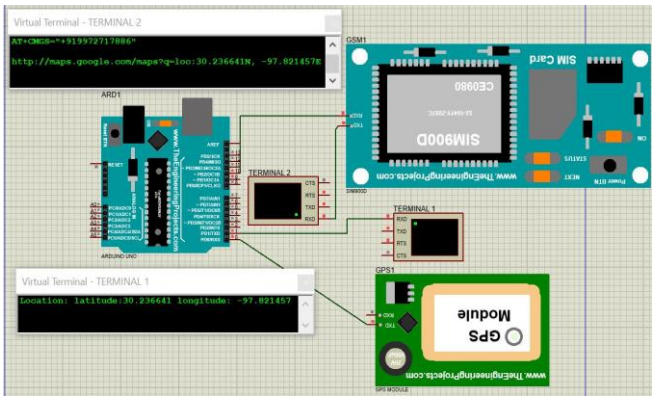


Fig 6: Simulation result of integrated GPS AND GSM

III. WORKING OF THE MODEL

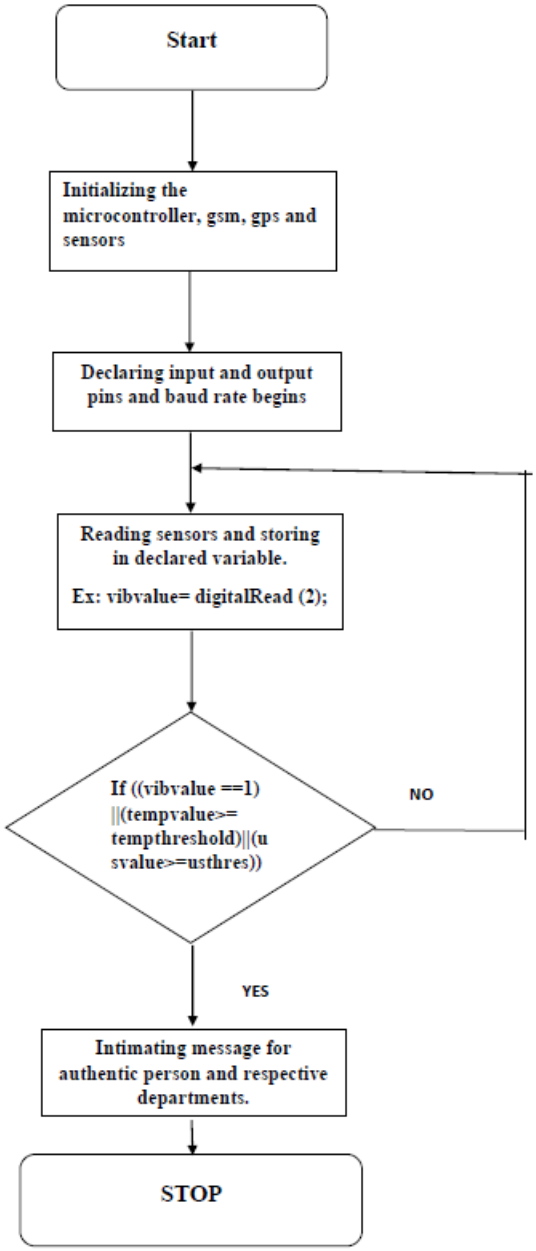


Fig 7: Flowchart of the model

IV. RESULT

The vehicle's real-time position (longitude, latitude), engine temperature, data acknowledgement (valid, invalid), and health are all saved in a text file on the SD card.

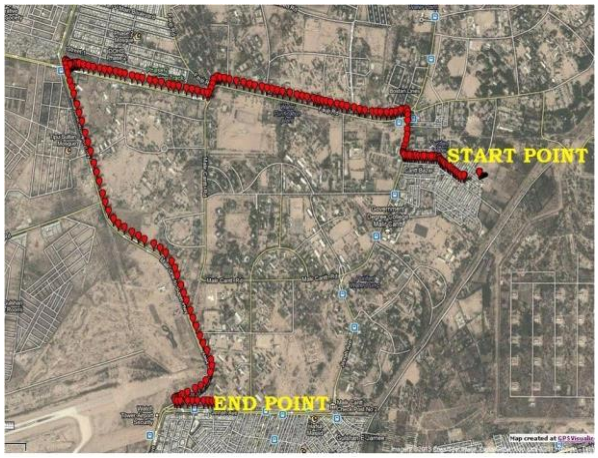
Foresee the tracking route to be accurate after sending it to the GPS visualiser, allowing for minor variations.

The aforementioned information is supposed to be sent to the user through SMS upon request.

It is predicted to lower the rate of fatalities.

It aids in the detection of theft.

Data that has been saved can be utilised to file an insurance claim.



V. FUTURE SCOPE

Semi-automatic and fully automatic vehicles have been tested and used on our roads, causing earthquakes in the fields of transportation, insurance and law. Although the promise of safer roads and fewer accidents is admirable, many accidents will occur during the transition period. As long as there is a steering wheel and a brake pedal (although the incidence is much lower), collisions will continue to occur in the driverless world. As cars become more autonomous, they will need more built-in sensors to read and store more data than we have seen before, such as camera images, driver information, distance to nearby vehicles, road markings, road signs Lights, people and other objects, etc. The volume of data recorded in semi-automatic and fully automatic vehicle EDR (or some of its future manifestations) is increasing, which is, of course, important for determining how people are injured and how property is damaged. At present, human errors are the cause of 90% of car accidents. The great potential for road **s**afety breakthroughs is being demonstrated in semi-automatic and fully automated vehicle testing. For eg., cars equipped with automatic braking systems can reduce rear-end collisions by about 40% on average according to the IIHS (Insurance Institute for Highway Safety). As advanced computers take on more and more driving functions, the problem will be the manufacturer or driver. As investigations into product liability cases become more common, product liability cases become more important. All EDR data is open access; Since continuous access to data has been and is an EDR issue, this challenge may continue into the future.)

VI. CONCLUSION

In this study, we proposed a reasonable vehicle system that uses GPS and GSM modules to provide real-time monitoring and information to individual users without the involvement of third parties. The microcontroller, which regulates the operation of other technologies involved in the process, is the most important technique used to build and implement this system.

In automobiles, the proposed system has a wide range of applications. It may be used in personal transportation for safety; it can also be utilized in public transportation, and it can assist transportation businesses in monitoring and tracking their employees' driving performance.

GPS technology is used in the advancement of technological car monitoring systems. Furthermore, the majority of car monitoring systems focus on car location rather than vehicle and driver condition. Meanwhile, the monitoring system for monitoring driver conditions is not linked to real-time positioning technology. With a stationary workstation, the monitoring system can be used.

This improved the project's usability and dependability. The proposed technique has the potential to be extremely useful to the automobile industry.

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