

Vehicle Monitoring, Tracking and Accident Rescue System Using IOT

Tk Senthilkumar^{#1}, Harishripriya M^{#2}, Vishnu Ks^{#3}
Rajalakshmi Institute of Technology, Chennai.

Abstract

Accidents have increased as the number of automobiles on road have increased accordingly the speed have increased due to advancement in technology that led to caused major loss of death. The present vehicle accidents and the rescue system used predominantly is having some disadvantages, which may look more efficient if there is more features added on it. Many lives could have been saved if emergency service could get accident information and reach in time. Nowadays, GPS has become an integral part of a vehicle system. This project has a GPS receiver, speed sensor and Accelerometer to monitor speed of a vehicle and detect accident based on crash sensors, monitored speed and send accident location to an Alert Centre. This proposal targets on real-time monitoring of the vehicle and keeps the record of the location so that they can track the location of the vehicle with the previous data even if the tracking system fails or the hardware is damaged. When the vibration sensor triggers based on the threshold limit and below the specified speed, it will assume that an accident has occurred. The system will then send the accident location acquired from the GPS along with the time and the speed by utilizing the GSM network. This will help to reach the rescue service in time and save the valuable human life.

Keywords

GPS(Global Positioning System),
GSM(Global System for Mobile),

I. Introduction

According to the world health Organisation, road traffic injuries caused an estimated 1.25 million deaths worldwide every year. That is, one person is being killed every 25 seconds. Low and middle income countries that have less number of vehicles had more of accidents when compared to high income countries. In Automobiles 4 wheelers and 2 wheelers constituting of age group 19-35 years world's 65% of deaths. Previously, several attempts have been made by agencies (public and private) like; campaigns, policies, trainings, etc. but none of them were effective on the mass. So, to influence and inculcate positive riding behaviour. And 3 out

of 4 road deaths are among men as the number of male riders is very high when compared to women. Middle-income countries have the highest road traffic death rates as the detection and rescue system is poor in these countries and they contribute around 20.1%. These data are calculated road fatalities per 1,00,000 population.

Around 46% of the road accidents and traffic deaths includes; pedestrians, cyclists and motorcyclists.

Nowadays the number of vehicles on the road has increased and there is upgrade of technology revolution in the use of added security features in Automobiles. As

increase in heavy automobile usage traffic has increased and thus resulting in rise of road accidents. Even though self-driving cars have taken the roads, they could not handle uncertain accidents. There are many disruptive technologies developed in vehicle monitoring system that have been implemented in high end cars and there is always been a need of a system that takes care of the vehicle 24/7, be it the theft or accident or immediate search and rescue facilities. Complete accident prevention is unavoidable but the accidents can be reduced or impact can be reduced significantly with the help of this prototype. This proposed provides the emergency facilities to the victims to be rescued in short period of time. When a case is filed, the affected victim is unable to get the details of the car which is responsible for an accident file a case against the victim responsible for accident and claim from the Insurance Company in case of an accident. The time delay happens due to traffic congestion for ambulance and getting insurance becomes a severe issue when the patient in the critical condition in case of accidents.

Emerging factors:

- Aggressive riding behaviour
- Risk taking behaviour
- Sources of irritation while driving
- Response depending on gender and age
- Factors leading to over speeding
- Perception about involvement
- Perception about road safety

II. Existing System

The vehicle tracking systems developed tracks the vehicle location and if the vehicle moves in the wrong direction it sends an alert to the driver about the driver going in wrong direction. The existing system includes automatic speed warning system connected to a mobile phone, fuel leakage detection system using MQ6 sensor and also temperature monitoring system. The real time monitoring has helped the users to keep track of the routes and also prevents vehicle from theft. The drowsy driver system has been developed that detects and alerts the driver feels sleepy using accelerometer and Random Eye Movement (REM). There has been many mobile applications built to track the vehicle and to prevent accidents. The alcohol detection sensor is also used to detect whether the driver is drunk or not and do not allow the driver to start the vehicle. If there is any detection of drowsiness or drunken drive it automatically switches of the vehicle and puts an alarm before Turning off the vehicle. This system has various drawbacks, because if the vehicle turns off automatically while driving in heavy traffic it leads to vehicle congestion and that sometimes leads to accidents. In foreign countries and also highways in India, the speed of normal driving is above 100 Km/hr. So in these conditions there is major chance of occurrence of accidents.

III. Proposed Method

The proposed system objective is to monitor the vehicle and stream location details of the vehicle. This system includes a Vibration sensor along with Contact sensor that detect the accident and the sensor data is also streamed to the cloud server Thingspeak.com, using a controller Node MCU ESP8266 that has an inbuilt Wifi module that can automatically connect to the cloud server via WiFi.

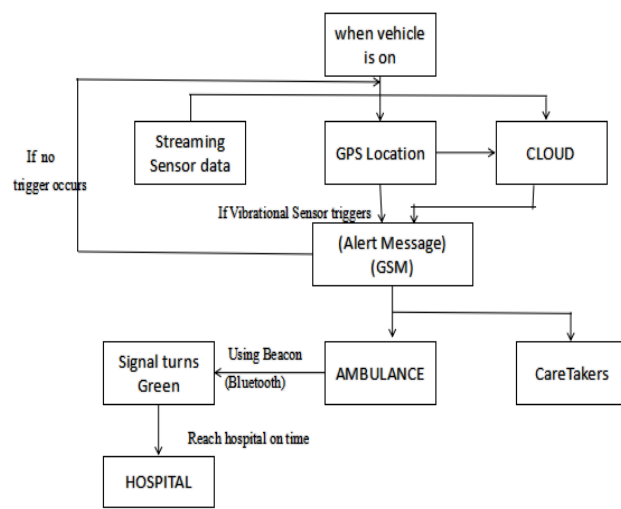
The four wheeler prototype car that is used for demo that has a Stepper motor interfaced and controlled with the help of motor driver. It is controlled with the help of Bluetooth module for navigation purpose.

There is another Bluetooth module that acts as beacon that will change the traffic signal, when the ambulance reaches the traffic signal. This reduces the time taken for an ambulance to reach the accident location on time.

GPS Module

A GPS module is abbreviated as Global Positioning System is a device that is capable of receiving information from GPS satellites and then display the device's geographical position with the help of latitude and longitude. Using Arduino IDE

software, the device will display the Latitude and Longitude. The Global Positioning System (GPS) uses a Global Navigation Satellite System (GNSS) made up of a network of 24 satellites, but currently 30, satellites placed into orbit by the U.S. Department of Defense. A GPS device can retrieve from the GPS system location and time information. A GPS reception requires an unobstructed line of sight to four or more GPS satellites, and is subject to poor satellite signal conditions. In exceptionally poor signal conditions, for example in urban areas, satellite signals may exhibit multipath propagation where signals bounce off structures or are weakened by meteorological conditions. Obstructed lines of sight may arise from a tree canopy or inside a structure, such as in a building, garage or tunnel. Today, most standalone GPS receivers are used in automobiles. The GPS capability of smart-phones may use assisted GPS (A-GPS) technology, which can use the base station or cell towers to provide the device location tracking capability, especially when GPS signals are poor or unavailable. However, the mobile network part of the A-GPS technology would not be available when the smart- phone is outside the range of the mobile reception network, while the GPS aspect would otherwise continue to be available.



Block diagram

GSM Module

GSM (Global System for Mobile Communications, is a standard set developed by the European Telecommunications Standards Institute (ETSI) to describe protocols for second generation (2G) digital cellular networks used by mobilephones. General packet radio service

(GPRS) is a packet oriented mobile data service on the 2G and 3G cellular communication system's global system for mobile communications (GSM) where protocols means set of invisible computer rules that govern how an internet document gets transmitted to your screen and 2G is short for second-generation wireless telephone technology and provides advantages like to provide the services such as text messages, picture messages and MMS (multimedia messages).

In simple language, GSM is primarily used to carry your voice on cell phone networks that uses that type of technology. GSM also introduced a series of features such as short messaging service (SMS), international roaming, fax and data messaging services. Another popular feature was the ability to let users download ringtones, logos, photos, that enabled the users to personalize their phones.

IV. Working

In this vehicle monitoring system, the sensors are connected to a controller that has a Wi-Fi ESP8266 Module embedded in it. This module helps to connect to any Wi-Fi hotspot that will connect it to the Cloud Server. This module helps to connect to the web server/cloud server and can stream data of the sensors.

The vibration sensor streams data to a Cloud Server via Node MCU ESP8266 whenever the vehicle is turned on. Once the Vehicle engine is on, the Controller starts streaming data from the sensor. The prototype developed is a 4-wheeler bot that is controlled via Bluetooth using Arduino UNO. Then the Vibration Sensor, GPS module and accelerometer are connected to Nodemcu ESP8266 that will trigger the GSM module to send a message to the Care taker regarding the accident along with the location of the accident. So, search and rescue operation is made easier for the care takers. The GPS location shows the present location to the user and care taker if required, so that anyone i.e., care taker or user can see the present location of the car, even if his car is stolen it can be easily tracked down.

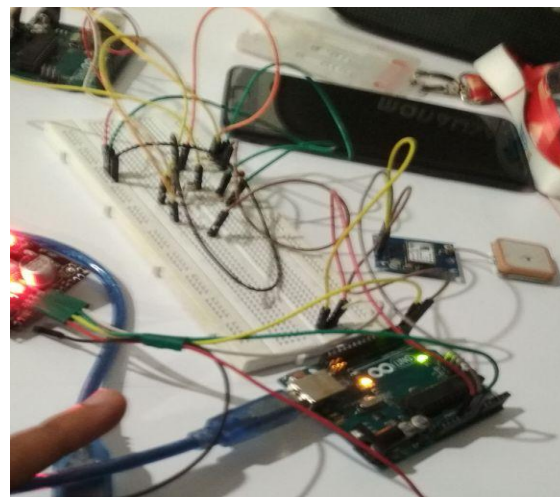


Figure: Project Setup.

It detects accident based on the threshold limit calibrated during crash testing of the car, so in case of accidents this triggers the GPS module to request for help.

The data is then analysed with the standard values which further confirms the accident of the car, unnecessary shock or vibration produced by machines, tilt of the car with respect to the earth's axis can be identified with the level of acceleration. Global Positioning System (GPS) is used to identify the location of the vehicle. This device will be incorporated in all four-wheeler's such that the government can take stringent actions on frequently Blacklisting Drivers and Car Owners.

Vehicles will have GPS/GSM enabled tracking modules and will be tracked in real time using cellular networks. The micro controller programmed for the above operations will control the various operations of the device.

Accident Rescue System

The Ambulance comes with an inbuilt beacon technology that will change the signal from Red signal to Green signal, this will regulate the traffic in-case if the ambulance reach the accident location early and also to hospital. The beacon is a Bluetooth module that has program sends packets continuously as soon they reach the traffic signal, it changes the Red signal of the traffic signal to Green to the lane of the Route.

V. Advantages

In this system, it allows the user to show the present location of the Vehicle with a help of a GPS module. It also sends an emergency/panic notification to the Acquaintance and family. It can store the timestamp of the every movement of the vehicle so it can be tracked where did the vehicle travelled and how much time it took for travelling on what speed.

VI. Disadvantages

The complexity comes when the crash and vibration sensor gets damaged or the circuit gets damaged. It cannot detect the accident in the absence of the circuit. The power consumption of the circuit is very high and the modules consume more power compared to controller. The network problem becomes an issue in case the subscriber is not available in certain areas. The GPS location of the vehicle becomes little bit complex when there is absence of Satellite connectivity. The sensor get damaged when exposed to longer time of usage.

VII. Results

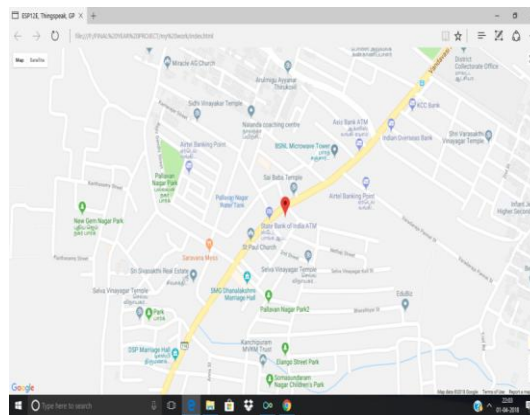
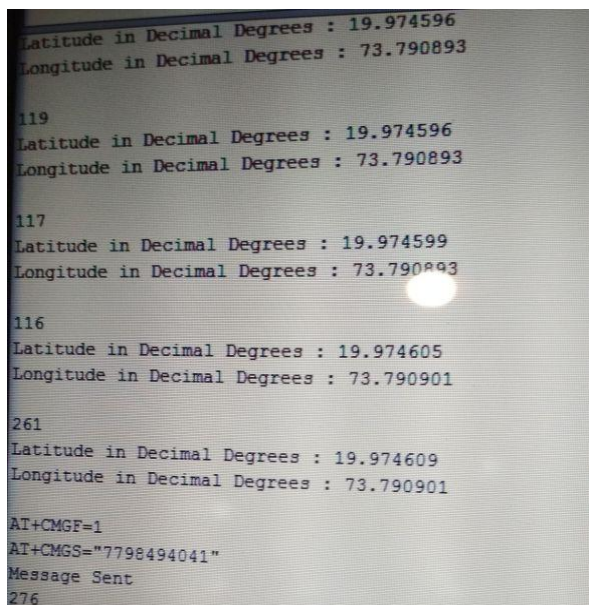


Figure: GPS location on Google Maps

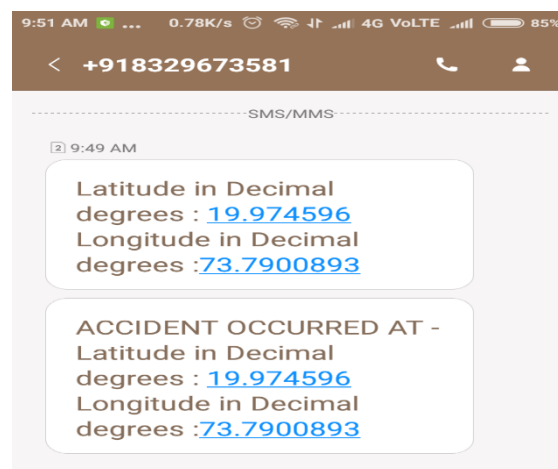


Figure: Latitude and Longitude of location

VII. Conclusion

In this system the vehicle monitoring system has successfully implemented which includes quick rescue system that reduces time on road to reach the accident zone. This system is also store the history of locations visited and the speed at which it was travelled on what time on cloud server. This data can be useful for traffic police department to study the traffic patterns of the motor vehicles according to geographical area and time.

VIII. References

- [1] A.Anusha , Syed Musthak Ahmed ,(2017) International Conference on Recent Trends in Electrical, Electronics and Computing Technologies.
- [2] P.Joythi and G.Harish, (2016) International Conference on Communication and Electronics Systems[ICCES].
- [3] PrashantA.Shinde ,Mr.Y.B.Mane , PandurangH.Tarange, (2015) International Conference on Circuit, Power and Computing Technologies[ICCPCT].
- [4] SeokJu Lee, GirmaTewolde, Jaerock Kwon,(2014) IEEE World Forum on Internet of Things[IOT].
- [5] SeoJu Lee; Tewolde, G.; JaerockKvoim.” Design and implementation of vehicle tracking system using GPS/GSM/GPRS technology and smartphone applications.”

- Internet of Things(WF-Iot),2014 IEEE World Forum on , vol., no., pp.353,358,6-8 March 2014.
- [6] Al Rashed. M.A.; Oumar, O.A.; Singh, D., “A real time GSM/GPS based tracking system based on GSM mobile phone,” Future Generation Communciation Technology(FGCT 2013 Second Conference on,vol.,no.,pp.65,68,12 Nov.2013.
- [7] HoangDatpham;Drieberg,M.; Chi Coung Nguyen, “Development of vehicle tracking system using GPS and GSM modem.” Open Systems(ICOS), 2013 IEEE Conference on., Vol., on., pp.89,94,2-4 Dec.2013.
- [8] Zhigang Shang, Wenli; He, Chao; Zhou, Xiaofeng; Han, Zhonghua;Peng, Hui; Shi, Haibo, "Advanced vehicle monitoring system based onarcgissilverlight,"Modelling, Identification & Control (ICMIC), 2012Proceedings of International Conference on , vol., no., pp.832,836, 24-26 June 2012.
- [9] Dr.SayleeGharge, ManalChhaya, Gaurav Chheda,Jitesh Deshpande, “Real time bus monitoring system using GPS,” An International Journal of EngineeringScience and Technology, Vol. 2, Issue 3, June 2012.
- [10] Pradip Suresh Mane, VaishaliKhairnar,“Analysis of bus tracking system using GPS on smart phones,” IOSR Journal of Computer Engineering (IOSR-JCE), Volume 16, Issue 2, Ver.XII, pp: 80-82, 2014.
- [11]Hemin Jose, LekshmyHarikrishnan, “A Review on vehicular monitoring and tracking,” IOSR Journal ofElectronics and Communication Engineering (IOSR-JESE), Volume 9, Issue 3, Ver.1, pp: 20-23, (May-Jun) 2014.