Vehicle Tracking System for Real Time Reporting

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Abstract: Accidental deaths are contributing a large percent to the total death caused in India throughout the year. There are various types of reasons of accidental deaths. One of the most common is deaths due to road accidents. Different systems are being developed to prevent accidents. We also here have made such an effort by designing a system that will be useful to avoid conditions causing accidents. In this system we have thought of tracking vehicle so as the user get the position of the vehicle & if in case accident occur emergency services can reach the destination as fast as possible. Thus during designing we have kept in mind to give facilities of both i.e. prevention & remedial services too. While making blueprint of the system we thought of using four sensors namely alcohol, gas & fire sensors. To manage the operations of system we have chosen Atmega16 microcontroller & also GPS &GSM modules in addition.

1.

IndexTerms **- Microcontroller Atmega16, GPS, GSM, gas sensor, alcohol sensor, fire sensor, vehicle tracking.**

I. INTRODUCTION

Density of vehicles on the road is increasing rapidly leading to various serious causes of which major one is accidents. Accidents can be caused by human error or failure in vehicle as well. Accident leads to injuries or even on the spot death. A wide range of factors can lead to an accident such as terrible road conditions, awful weather, fault in the vehicle or simply manual blunders like drink & drive. Any of the above reason can cause serious effect to the people travelling by the vehicle & also to pedestrians or traveling by the same route. To avoid above conditions a system is needed that can keep the tracking of the vehicle continuously & also report to the concern authorities in case of any emergency.

Hence we thought of designing the system that can give the real time location accurately with longitudinal & latitudinal marking with the use of GPS module. Also this system makes use of GSM module that communicates about any mishap by calling & also sending a SMS. This system is very beneficial in cases where the life of people injured in accident can be saved by sending timely help. This system can help people at different places like hospitals, police station, fire station & insurance agencies to the get the information quickly & carry out their respective work in case of occurrence of an accident.

II Literature Survey:

Road accidents during 2017 attributable to different kinds of traffic regulations infringements reveals that over speeding represents the main violation related with accidents, and 14,071 accidents took place due to drunken driving/consumption of alcohol & drug, 4,776 persons were killed and 11,776 were injured.[1]

M. Al-Khedher Ramadan et al. [2] has designed a machine in which the consumer can follow the location of aimed means of transport on Google Earth. With GPS locator, the intended current location is decided and shared, along with a range of parameters obtained by vehicle's data port, by means of Short Message Service (SMS) through GSM networks to a GSM modem that is linked to PC or laptop. The GPS coordinates are corrected with a discrete Kalman filter

A tracking system can notify the position and road travelled by vehicle, and that information can be observed from any other remote place. It also includes the web application that gives user precise location of object. These are the features of system proposed by PankajVerma et al. [3].

By modifying the current components, V.Ramya et al. [4] provided vehicle cabin safety, security based on embedded system which administrates the concentration of the poisonous gases such as CO, LPG and alcohol within the vehicle and provides vigilant information as alarm during the dangerous situations. The SMS sends to the authorized person through the GSM. In this method, the IR Sensor utilized to notice the static barrier in front of the vehicle and the vehicle stopped if any barrier identified.

Zhang Wen et al. [5], investigates location key, map corresponding and squeezed data associated with the positioning, forecasts the movement of the vehicle location.

Chen et al. [6] explained that, the network were built up by hardware and software of the GPS- GSM [7, 8]. The proposed GPS/GSM based System has the two components, primary is a mobile unit and one more is controlling station. The system processes, interfaces, connections, data communication and reception of data linking the mobile unit and control stations are functioning successfully. They observed that the results are compatible with GPS technologies. For user, it is a box that holds a GPS chaser and a GSM modem. When consumer ask for location from the web or application subsequent to registration and logging into the web server an SMS request will be sent to the GSM modem in consumer device. It necessitates internet connectivity on both sides of client and server which is not convenient for some cases where there is no internet connectivity at any of the server or client sides. Additionally, the connection between the server and client should be managed by both server and client. Sonia C.V et al. [9] designed an android application to track mobile phones. It has SMS based location tracking system using GPS data. It did not include online tracking method with which one can discover the place without using SMS service. KuanYew Tan, et al. [10] executed a campus vehicle tracking system with the aid of WiFi proximity method and GPS data.

III. Components Used:

3.1Microcontroller Atmega16: Microcontroller is the brain of any system. We used Atmega16 microcontroller of AVR family to carry out the operation of our system. Atmega16 is an 8 bit enhanced RISC microcontroller that can process multiple instructions in a single clock cycle so it has high processing speed of 1MIPS i.e. beneficial for our system. Moreover this controller is cost efficient & provides us with a large number of features like 16 KB programmable flash memory, static RAM of 1 KB, EEPROM of 512 Bytes, Timers, UARTS, JTAG, ADC, SPI, 32 registers, 4 ports & much more. It is a 40 pin IC and requires 16MHz frequency to work also it can be programmed well by using 131 instruction's instruction set.

3.2 GPS Module - Global Positioning system is used to detect the exact location on the earth of any respective device. This system works with help of satellites present in the space & ground stations through radio frequency signals. Whenever we ought to use feature like tracking or navigation in any system it is necessary to make use of GPS module in the circuitry. GPS module is simply a GPS receiver that identifies the location. GPS module used by us in this system requires 9V-12V power & has features such as 9600 baud rate, RS232 protocol & various other features too. We get the GPS Data as output i.e. desired location in serial form in NMEA (National Marine Electronics Association) string format. NMEA is a standard format in which we receive output where parameters like longitude, latitude, time etc are differentiated with the help of comma. The location received always begins every line starts with '$' in GPS data. There is a numbers of line but here we used to collect the data needed for our system is in the form of $GPGGA.

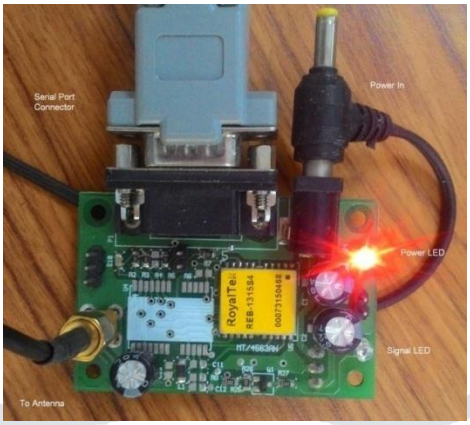


Fig. 1 GPS Module

Let us understand with an example –

Name	Example	Units	Description
Message ID	$GPGGA		**GP** represent that it is a GPS position ,GGA Protocol Header
UTC Time	181908.00		time stamp: UTC time in hours, minutes and seconds, hhmmss.sss
Latitude	3404.7041778		Latitude in the DDMM.MMMMM format. Decimal places are variable, ddmm.mmmm
N/S Indicator	N		N=North, S=South
Longitude	07044.3966270		Longitude in the DDDMM.MMMMM format. Decimal places are variable, dddmm.mmmm
E/W Indicator	*W*		E=East, W=West
Quality Indicator	*4*		1 = Uncorrected coordinate 2 = Differentially correct coordinate (e.g., WAAS, DGPS) 4 = RTK Fix coordinate (centimeter precision) 5 = RTK Float (decimeter precision. Here Fix GPS SPS mode
Satellites Used	*13*		Denotes number of satellites used in the coordinate.
HDOP	*1.00*		Horizontal Dilution of Precision
MSL Altitude	*495.144*	Meters	Mean Sea Level altitude of antenna
Units	M	Meters	
Geoid Separation	*29.200*	Meters	
Units	M	Meters	

Age of Diff. Corr.	*0.10*		Null field if DGPS is not used
Correction Station ID	0000		
Checksum	**40*		

3.3 GSM Module – In our system we are making use of SIM900 GSM module. It uses RS232 protocol to connect with microcontroller. We can use it for making calls & sending SMS by programming it using AT commands. It requires 12V supply & baud rate is configurable from 9600 to 115200. It also posses TCP/IP protocol stack for transfer of data through GPRS.

Fig. 2 GSM Module

3.4 LCD: LCD screen is a module that is used to display the needed content. Commonly 20x4 LCD display module is used on large scale. It is preferred than any other display as it is cost efficient. In 20x4 display there are 4 lines each one displaying 20 characters. It is of 5x7 pixel resolution. A 20x4 LCD means it can display 20 characters per line and there are 4 such lines.

3.5 Sensors:

3.5.1 Alcohol sensor - MQ3 alcohol sensor has been used in the system. It is capable of detecting presence of alcohol gases in between 0.05mg/L to 10mg/L. The sensor is made of SnO2 which has low conductive in clean air & as alcohol in the air increases its conductivity too increases. Whenever a person sits in driver seat of a vehicle, the system checks. The alcohol sensor - checks if the person has consumed alcohol or not.MQ3 sensor is suitable for detecting alcohol concentration from driver's breath. It has high sensitivity and fast response time. If a drunk driver tries to sit on a driver seat, then the alcohol sensor MQ3 detects the presence of alcohol.

Fig.3 Alcohol Sensor.

3.5.2 Gas Sensor – It is used to detect smoke or leakage of different harmful gas like butane, methane, carbon monoxide, hydrogen, propane, LPG.

Fig. 4 Gas Sensor.

3.5.3 Fire Sensor – It is a flame sensor that can detect ordinary light. It is capable of detecting flame in the wavelength of 760nm-1100nm.

Fig.5 Fire Sensor.

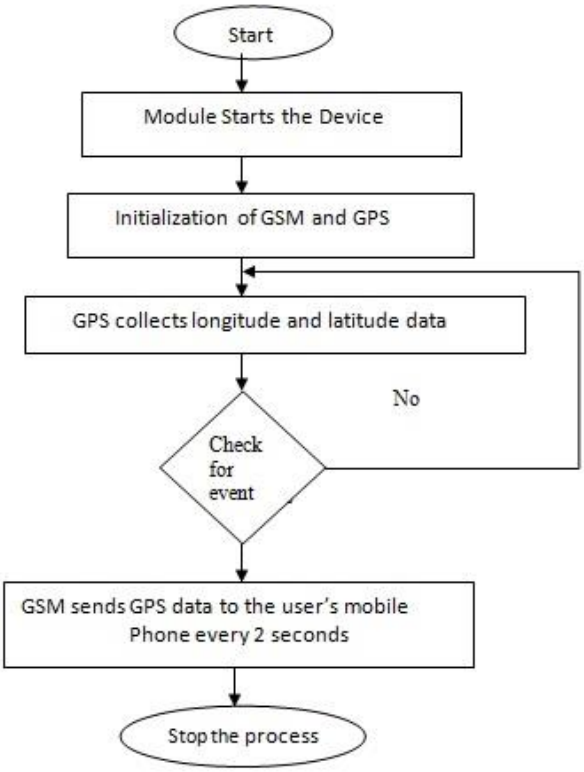
3.5.4 Impact Sensor –

Impact sensor also known as shock detector is used to detect whether a physical shock has occurred or not.

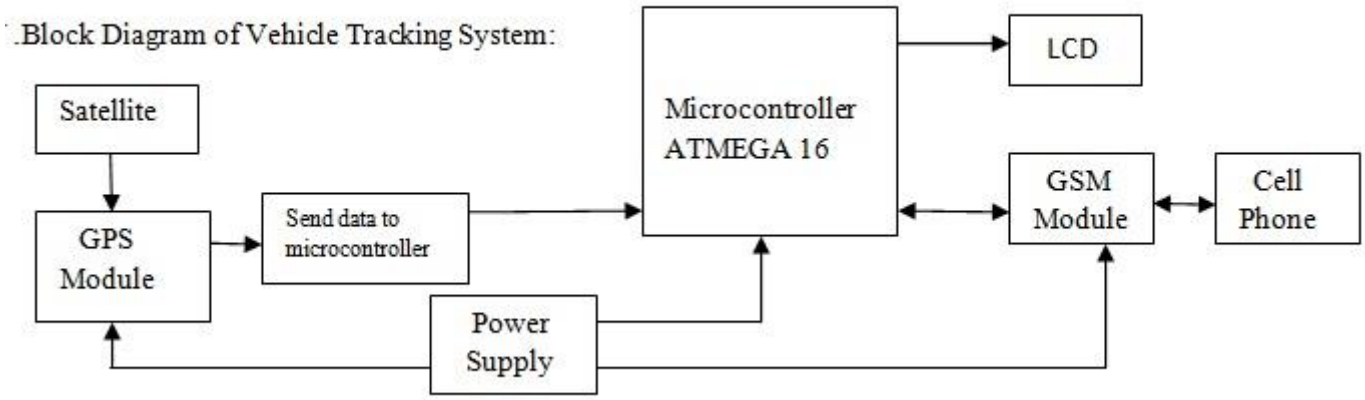
If an accident has occurred, the Impact sensor provides a high value and it indicates the occurrence of an accident. It connects wirelessly to mobile phone. When accident is occurred message will be displayed in the android phones having GPS and GSM in it.GSM is a globally accepted standard for digital mobile communication.

Fig.6 Impact Sensor.

IV Flow Chart:



V Block Diagram of Vehicle Tracking System:



VI. Functioning of Vehicle Tracking System:

As the Circuit is powered ON the system performs initialization steps for the GPS and GSM modules attached to the monitoring system. The microcontroller pauses for some time to allow for the initializations and then starts polling for the data coming from the GPS module. After power ON the GPS module takes few seconds to get a FIX from satellites so that the incoming data is reliable, this is detected from the incoming data from GPS. Once the GPS data is consistent, the microcontroller keeps on watching the sensors like fire sensor, gas sensor, impact sensor etc. attached to the vehicle monitoring system. It also scans the incoming data from the GPS module and from the incoming data extracts the $GPGGA line from which the information about the location and the current time is extracted. If no serious event occurred (detected by sensor) it keeps on monitoring the sensors and the $GPGGA data from GPS module. This information is continuously displayed on the 20×4 LCD display in real time as shown in Fig. 7.

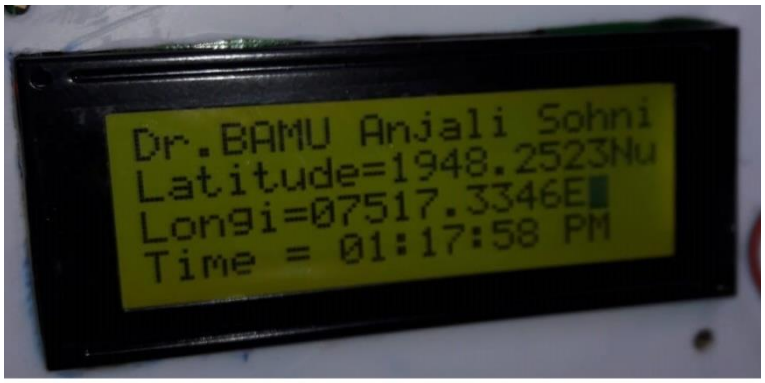


Fig.7 The LCD display on the vehicle tracking system showin realtime location parameters

In the event of an accident or detection of error signal from a sensor, the microcontroller initiates the processing of necessary action. In the present design it sends a SMS to the mobile number registered in the tracking system. The SMS contains the information about the time at which the event occurred, it also includes the information about what actually happened was it an impact of accident, or detection of a fire or a gas leak or the like. For critical events like accident or fire, after sending the SMS it gives a ring to the same mobile number to alert the concerned person that something wrong has occurred with the vehicle who can check the SMS to find out what has happened and at what location. This is expected to be of great help to individual and fleet operators interested in monitoring the vehicle. There is provision to program the micro controller to send the information about the location of the vehicle in terms of longitude and latitude every hour (or at specified time intervals) in order to track the movement of the vehicle along the planned route at proper time.

The sensors attached on the enclosure of the vehicle tracking system are shown in Fig. 8.

Fig. 8 The Fire, Gas and alcohol sensors mounted at the top of the tracking system

Inside view of the fully assembled vehicle tracking system is shown in following Fig. 9

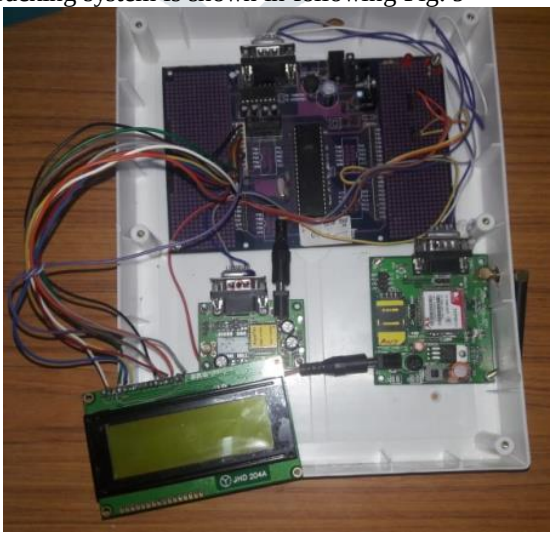
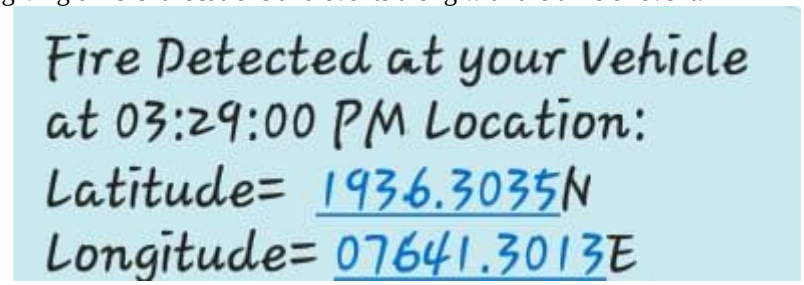


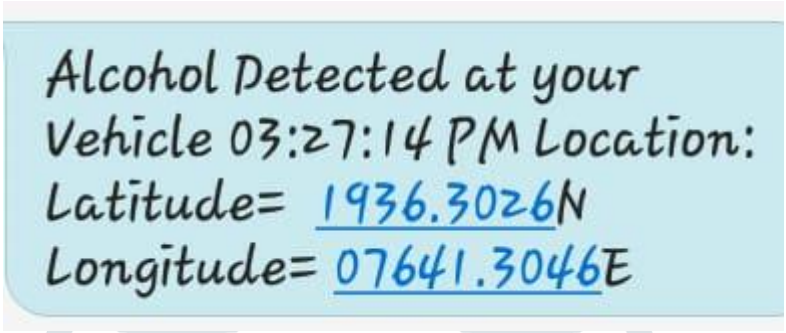
Fig No. 9 Vechicle tracking System

VII. Results:

The entire vehicle tracking and real time monitoring system is designed and constructed using AVR family microcontroller Atmega16. The system is thoroughly tested for its performance in real field conditions during long drives of about 200Km and the

functionality of the sensors and SMS sending is tested and found to be in perfect order. The screenshot shows few SMS's received on the mobile handset giving different locations and events along with the time of event.





As an example few observations the tabulated below:

Sr.No	Event	Latitude	Longitude	Time
1	Fire	1952.5108N	07520.0589E	5:04pm
2	Alcohol	1950.5926N	07556.6184E	08:18am

VIII. Conclusions:

The vehicle tracking system designed by us is very helpful in today's world. We have tested it on the basis of various parameters such as drunker driver, mock accident, fire detection and we found the system to be fully successful as it responds correctly by sending SMS and giving ring to the emergency contact number and GPS module shows us the exact location. Thus we can conclude that our system is simple, useful at the same time cost efficient one, to meet the requirements of user.

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