GPS & GSM based vehicle tracking andsecurity system

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Abstract:-A GPS & GSM Based Vehicle Tracking Security System combine installation of an electronic device in vehicle, with purpose-designed computer software to enable to track the vehicle's location. In vehicle tracking systems Global Positioning System technology is use for finding the location of the vehicle. Vehicle location information can be viewed on electronic maps via the Internet or specialized software. This system isuseful for car theft situations, for adolescent drivers being watched and monitored by parents exceeding speed limit, or leaving a specific area. It also used for safe transportation in industries.

Keywords: -GSM, GPS, Vehicle Tracking, Security, Microcontroller, SMS, Map.

I.   INTRODUCTION

In the last few years, India has progressed at such a great rate that many companies have strongly established themselves. These companieshas huge amount of workforce with them. Arranging transportation to such huge mass is a cumbersome task involving many complexities. Generally, this transport is arranged through the local transport vendors on a yearly contract basis. The development of satellite communication technology is easy to identify the vehicle locations. Vehicle tracking systems have brought this technology to the day-to-day life of the common person. Today GPS used in cars, ambulances, fleets and police vehicles are common sights on the roads of developed countries. All the existing technology support tracking the vehicle place and status. The GPS/GSM Based System is one of the most important systems, which integrate both GSM and GPS technologies. This system designed for users in land construction and transport business, provides real-time information such as location, speed and expected arrival time of the user is moving vehicles in a concise and easy-to-read format. This system may also useful for communication process among the two points.

Currently GPS vehicle tracking ensures safety while travelling. This vehicle tracking system found in clients vehicles as a theft prevention and rescue device. Vehicle owner or Police follow the signal emitted by the tracking system to locate a robbed vehicle in parallel the stolen vehicle engine speed going to decreased and pushed to off. After switch of the engine, motor cannot restart without permission of password. This system installed for the four wheelers, Vehicle tracking usually used in navy operators for navy management functions, routing, send off, on board information and security. The applications include monitoring driving performance of a parent with a teen driver. Vehicle tracking systems accepted in consumer vehicles as a theft prevention and retrieval device. If the theft identified, the system sends the SMS to the vehicle owner. After that vehicle owner sends the SMS to the controller, issue the necessary signals to stop the motor. The vehicle tracking and locking systems view analysis, the built system can segment features of moving objects from moving background and offer a collision word of warning on real-timeof all the applications of GPS,Vehicletracking have brought this technology to the day-to-day life of the common man. Today GPS fitted cars, ambulances, fleets and police vehicles are common sights on the roads of developed countries. Known by many names such as Automatic Vehicle Locating System (AVLS), Vehicle Tracking and Information System (VTIS), Mobile Asset Management System (MAMS), these systems offer an effective tool for improving the operational efficiency and utilization of the vehicles. GPS is used in the vehicles for both tracking and navigation. Tracking systems enable a base station to keep track of the vehicles without the intervention of the driver whereas navigation system helps the driver to reach the destination. Whether navigation system or tracking system, the architecture is more or less similar. The navigation system will have convenient, usually a graphic display for the driver which is not needed for the tracking system.

II.   DESCRIPTION

Vehicle tracking system is mainly used to track the position of the Vehicle by the owner or can also be used in the public transportation system by the people to know the location of the vehicle. When the vehicle is stolen, the location data from tracking system can be used to find the location and can be informed to police for further action. Vehicle tracking System can even detect unauthorized movements of the vehicle and then alert the owner. This gives an edge over other pieces of technology for the same purpose. This accident alert system in it detects the accident and the location of the accident occurred and sends GPS coordinates to the specified

mobile, computer etc. The fire detector circuit in it is used to detect fire in the vehicle, if the temperature inside the vehicle goes above a certain limit then a warning will be automatically send to the intended receiver. The infrared sensor which is additionally interfaced to the microcontroller is used to detect the obstacles and accidents; in any case if any mishap occurs then its warning will be directly send to the intended receiver. The existence of vehicle tracking devicethen can be used to reduce the insurance cost. The vehicle tracking hardware is fitted on to the vehicle. It is fitted in such a manner that it is not visible to anyone who is outside the vehicle. Thus it operates as a covert unit which continuously sends the location data to the monitoring unit.

SPECIFICATIONS AND CHARACTERISTICS FOR GSM
Frequency band—the frequency range specified for
GSM is 1,850 to 1,990 MHz (mobile station to basestation).
Duplex distance—the duplex distance is 80 MHz
Duplex distance is the distance between the uplink and downlink frequencies. A channel has two frequencies,80 MHz apart.
Channel separation - the separation between adjacent carrier frequencies. In GSM, this is 200 kHz.
Modulation -Modulation is the process of sending a signal by changing the characteristics of a carrierfrequency. This is done in GSM via GaussianMinimum shift keying (GMSK).
Transmission rate - GSM is a digital system withan over-the-air bit rate of 270 kbps.

The principle behind the unprecedented navigational capabilities of GPS is triangulation. To triangulate, a GPS receiver precisely measures the time it takes for a satellite signal to make its brief journey to Earth - less than a tenth of a second. Then it multiplies that time by the speed of a radio wave—300,000 km (186,000 miles) per second—to obtain the corresponding distance between it and the satellite. This puts the receiver somewhere on the surface of an imaginary sphere with a radius equal to its distance from the satellite. When signals from three other satellites are similarly processed, the receiver's built-in computer calculates the point at which all four spheres intersect, effectively determining the user's current longitude, latitude, and altitude. (In theory, three satellites would normally provide an unambiguous three-dimensional fix, but in practice at least four are used to offset inaccuracy in the receiver's clock.) In addition, the receiver calculates current velocity (speed and direction) by measuring the instantaneous Doppler Effect shifts created by the combined motion of the same four satellites. Although the travel time of a satellite signal to Earth is only a fraction of a second, much can happen to it in that interval. For example, electrically charged particles in the ionosphere and density variations in the troposphere may act to slow and distort satellite signals. These influences can translate into positional errors for GPS users -a problem that can be compounded by timing errors in GPS receiver clocks. Further errors may be introduced by relativistic time dilations, a phenomenon in which a satellite's clock and a receiver's clock, located in different gravitational fields and traveling at different velocities, tick at different rates. Finally, the single greatest source of error to users of the Navstar system is the lower accuracy of the civilian C/A-code pulse. However, various augmentation methods exist for improving the accuracy of both the military and the civilian systems.

Features of GSM
1. Single supply voltage 3.2v-4.5v.
2. Typical power consumption in SLEEP Mode: 2.5mA.
3 .SIM300 tri-band.
4. MT,MO,CB, text and PDU mode, SMS storage: SIM card.
5. Supported SIM Card :1.8V,3V

III.   EASE OF USE
Its use is that much simple that an illiterate person can also use that. When a user want to send a secure message to another user than simply it only have to type the text on keyboard that it wants to transmit. It is very secure because only authorized user can actually access the actual message other user which want to hack or interpret the signal, gets only encrypted message and for decryption they want exact codes used in encryption. Only authorized receiver knows about the actual decryption codes and only able to decrypt it. So it is very much secure and easy method for message transmission.

IV.   BLOCK DIAGRAM
In this project 8051 microcontroller is use for interfacing to various hardware peripherals. The current design is an embedded application, which continuously monitors a moving vehicle and reports the status of vehicle on demand. For doing so an 8051 microcontroller is interfaced serially to GSM Modem and GPS Receiver. The GPS receiver will continuously give the data i.e. the latitude and longitude indicating the position of the vehicle and time and send it to microcontroller, a GSM modem containing a SIM card of valid service

provider is used to send the Latitude and Longitude (position) of the vehicle from a remote place. The GPS modem gives many parameters as the output, but only the NMEA data coming out is read and displayed on to the LCD. The same data is sent to the mobile at the other end from where the position of the vehicle is demanded. The hardware interfaces to microcontroller are LCD display, GSM modem and GPS Receiver, the design uses RS-232 protocol for serial communication between the modems and the microcontroller, a serial driver IC MAX 232 is used for converting TTL voltage levels to RS-232 voltage levels. MAX 232 is used for GSM, GPS and microcontroller to communicate serially. A 16x2 LCD is used for displaying location values. A 9v battery is used to power up the circuit. The program has been developed which is used to locate the exact position of the vehicle. Kiel uVision2is an IDE (Integrated Development Environment) that helps you write, compile, and debug embedded programs. It encapsulates the following components: project manager, a make facility, Tool configuration, Editor, a powerful debugger.
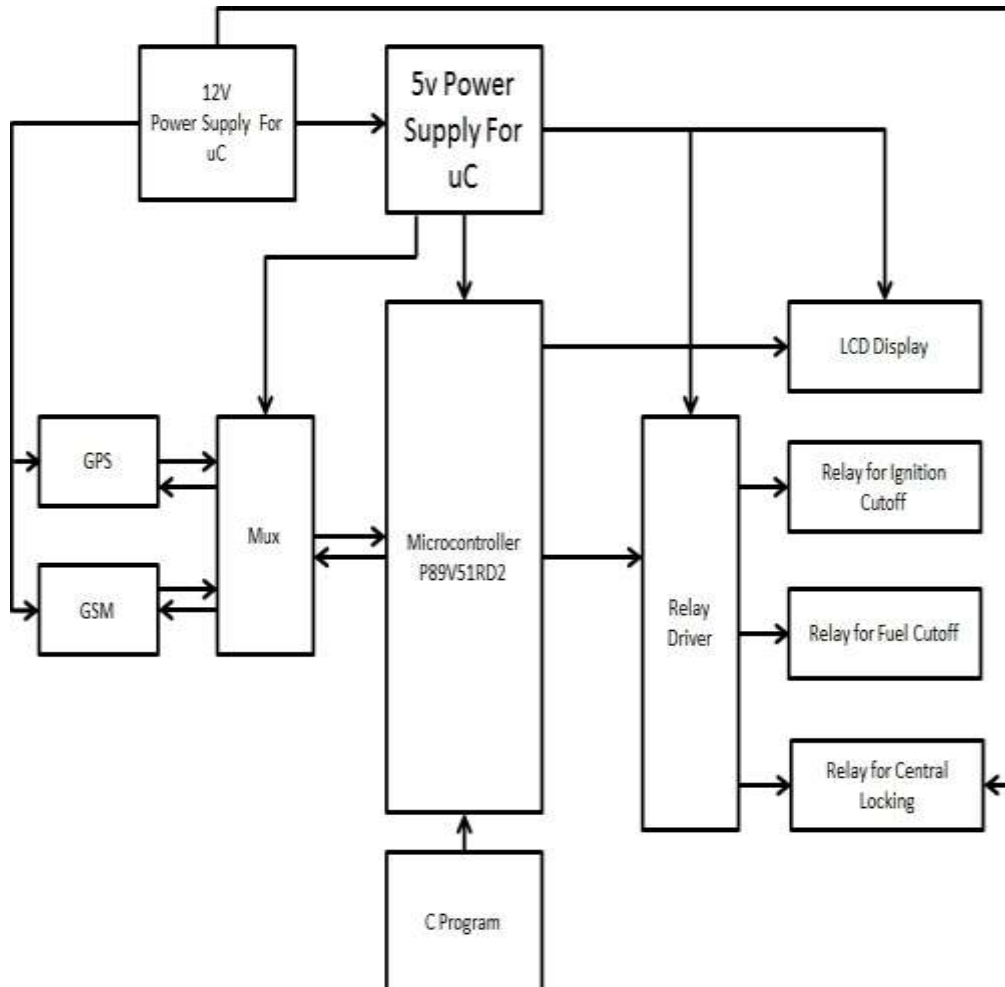
Fig. 1: Block diagram

The software programming is done in 'C' language .Data (co-ordinates) received by GPS from the satellites is defined in the software .Decoding the NMEA (National Marine Electronics Association)is the main purpose of developing this software. The mobile number of the user should be included in the software programming in order to receive the location values from the SIM card which we are using in GSM modem. The NMEA protocol consists of set of messages. These messages are ASCII character set .GPS receives data and present it in the form of ASCII comma-delimited message strings.'$' sign id used at the starting of each message.

The locations (latitude and longitude) have the format of ddmm.mmmm. i.e. degress minutes and decimal minutes. The software protocol consists of GGA (global positioning system fixed data) and GLL (geographic position latitude/longitude).But in this system we are using CGA only.
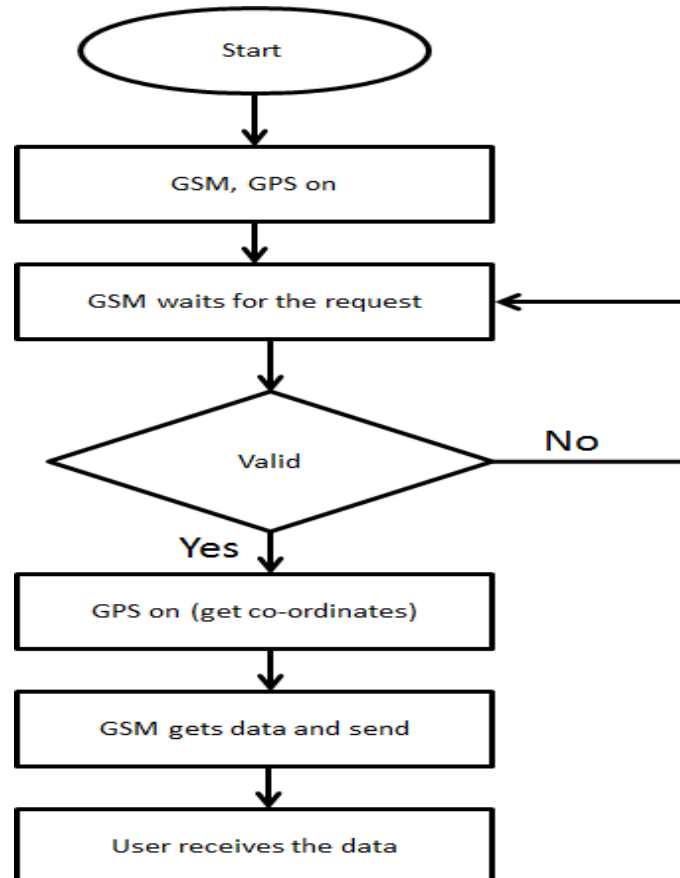
Fig. 2: Program Flowchart of tracking system.

V.   LIST OF COMPONENTS

[A] Hardware:
    GSM Modem SIM 300
    GPS Modem
    Microcontroller
    MAX 232
    RS 232
    Voltage regulator IC
[B] Software:
    Keilvision 3.0
    Flash magic

VI.   APPLICATIONS

The project that has been introduced here can be used for variety of applications -
1. Car navigation.
2. Fleet management/tracking.
3. Palmtop, Laptop, PDA, and Handheld.
4. Location Based Services enabled devices.
5. Vehicle scheduling
6. Route monitoring
7. Driver monitoring
8. Accident analysis

The other applications for this project are in military, navigation, automobiles, aircrafts, fleet management, remote monitoring, remote control, security systems, teleservices, etc.

VII.   ADVANTAGES

Commercial fleet operators are by far the largest users of vehicletracking systems. These systems are used for operational functionssuch as routing, security, dispatch and collecting on-boardinformation. These are also used for fire detector in large vehicles like train, bus etc. because the vehicle like train contains large number of peopleand the sending alert of fire accident can save many lives. These are just a few advantages of the project that has beenintroduced in this report. We can interface more numberofsensors in order to serve multiple purposes. The microcontrollerthat has been used in this project have inbuilt ADCs and hence thecontroller is capable of accepting analog inputs, which is thebiggest advantage. Since all real world signals are analog in nature, by incorporating different sensors required purpose can be served.

IV.   CONCLUSION

It isable to control the security of vehicle and control theft of the vehicle. It respond by giving location where it is whenever vehicle is lost and if needed to control also it can be possible. The system is capable to find the accident of vehicle and data to relate with location of the vehicle. The GSM & GPS based Vehicle Tracking and Security System has become increasingly important in cities and it is more secured as compare to other systems. Due to recently happened mishaps such as burglary, rape cases etc., the safety, especially of the women, has become a number one priority, with this we can have a good control in it. The car can be turned off by only with a simple SMS. The microcontroller is the brain of system and the GSM modem controlled by AT commands facilitates data transmission over GSM network while the GPS module provides the location data. The system will provide accurate data in a timely manner such that it will enable the security company to know the location of the tracked car and facilitate an early recovery of the tracked car. Implementation of GPS in vehicles is certainly a revolutionary impact in transportation science in a developing country like India where there is an extremely high urban as well as rural vehicular transition every day. The system included two main components: transmitting embedded module to interface in-vehicle GPS and GSM devices in order determine and send automobile location and status information via SMS. The second stationary module is a receiving module to collect and process the transmitted information to a compatible format with Google Earth to remotely monitor the automobile location and status online. We can collect all data such as position of the car. Upgrading this setup is very easy which makes it open to future requirements without the need of rebuilding everything from scratch, which also makes it more efficient.

V.   FUTURE SCOPE

We can use the EEPROM to store the previous Navigating positions up to 256 locations and we can navigate up to N number of locations by increasing its memory. We can reduce the size of the kit by using GPS+GSM on the same module. We can increase the accuracy up to 3m by increasing the cost of the GPS receivers.

We can use our kit for detection of bomb by connecting to the bomb detector. With the help of high sensitivity vibration sensors we can detect the accident. Whenever vehicle unexpectedly had an accident on the road with help of vibration sensor we can detect the accident and we can send the location to the owner, hospital and police. We can use our kit to assist the traffic. By keeping the kits in the entire vehicles and by knowing the locations of all the vehicles. If anybody steals our car we can easily find our car around the globe. By keeping vehicle positioning vehicle on the vehicle.

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REFERENCES

[1].   GPS & GSM based any vehicle tracking and security system. Shweta Patil, Mansi Lad, Nikita Patel, Pooja Agarwal, Dhrumil Patel.

[2].   January 2014

[3].   Vehicle Tracking and Locking System Based on GSM and GPS. R.Ramani1,S.Valarmathy,Dr.N.SuthanthiraVanitha,S.Selvaraju2,M.Thiruppathi,

[4].   R.Thangam. August 2013 in MECS

[5].   Mrs.RamyaKulandaivel1, P.Ponmalar2,B.Geetha3, G.Saranya4 "GPS and GSM based vehicle information system" International Journal of Communications and Engineering Volume 01– No.1, Issue: 01 March2012

[6]. Deepak Mishra, Apurv Vas, PuneetTandon "A novel and cost effective approach to public vehicle tracking system" International Journal of UbiComp (IJU), Vol.3, No.1, January 2012

[7]. Ruchika Gupta and BVR Reddy "GPS and GPRS Based Cost Effective Human Tracking System Using Mobile Phones" Volume 2 • No. 1 • January-June 2011

[8]. Mohammad A. Al-Khedher "Hybrid GPS-GSM Localization of Automobile Tracking System" International Journal of Computer Science & Information Technology (IJCSIT) Vol 3, No 6, Dec 2011

[9]. Francis EnejoIdachaba "Design of a GPS/GSM based tracker for the location of stolen items and kidnapped or missing persons in NIGERIA"ARPN Journal of Engineering and Applied Sciences VOL. 6, NO. 10, OCTOBER 2011

[10]. Adnan I. Yaqzan, Issam W. Damaj, and Rached N. Zantout "GPS-based Vehicle Tracking System-on-Chip" Proceedings of the World Congress on Engineering 2008 Vol I WCE 2008, July 2 - 4, 2008, London, U.K.

[11]. T. Krishna Kishore, T.SasiVardhan, N.LakshmiNarayana "Vehicle Tracking Using a Reliable Embedded Data Acquisition Sytem With GPS and GSM" IJCSNS International Journal of Computer Science and Network Security, VOL.10 No.2, February 2010

[12]. PankajVerma,J.S Bhatia "Design and Development of GPS –GSM Bases Tracking System with Google Map Based Monitoring" International Journal of Computer Science ,Engineering and Applications Vol.3,No.3,June 2013

WEBSITES:

[1]. http://en.wikipedia.org/wiki/Sevensegment_display
[2]. http://www.gsm-modem.de/
[3]. http://www.datasheetsite.com/datasheet/MAX232
[4]. http://www.rentron.com/rf_remote_control.htm