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VEHICLE TRACKING AND MONITORING SYSTEM USING GPS AND GSM/GPRS

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ABSTRACT

Abstract: This system offers an affordable and compact design implemented for tracking and monitoring vehicle's Instantaneous speed, peak speed, distance and current location with the help of Global Positioning System (GPS) and Global System for Mobile Communication (GSM). The system consist of two parts, one is ambulatory and incorporated in the target vehicle which comprises of a GPS receiver, a microcontroller and a GSM modem with periphery display and power units. Other is stable at a remote place which consists of a GSM modem, being on the pivotal locus, a cell phone. The operator needs to send a message to GSM device, by which it gets activated. Once GSM gets activated it takes the last received vehicle's Instantaneous speed, peak speed, distance and current location values from the buffer and sends a SMS (short message service) to the particular cell number or laptop which is predefined in the program. Once message has been sent to the predefined device the GSM gets deactivated and GPS gets activated. By using the information in the SMS one can plot the location of vehicle on Google map

KEYWORDS: GPS, GPRS, GSM modem, SMS, Ambulatory unit, Stable unit, NMEA.

I. INTRODUCTION

Vehicle tracking and monitoring system's main aim is to give Security to all vehicles. This is the improved security systems for vehicles. The latest like GPS are highly useful now a day, this system enables the owner to observe and track his vehicle and find out vehicle movement and its past activities. This new technology, popularly called as vehicle tracking and monitoring systems which created many wonders in the security of the vehicle. This hardware is fitted on to the vehicle in such a manner that it is not visible to anyone who is inside or outside of the vehicle. Thus it is used as a covert unit which continuously or by any interrupt to the system, sends the location data to the monitoring unit.

When the vehicle is either stolen or rash drive by the driver, the location data from tracking system can be used to find the location as well as vehicle's peak speed can be informed to police for further action. Some 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. Therefore this proposed system detects the location, distance, instantaneous and peak speed of the vehicle and sends GPS coordinates with the other required data to the specified mobile, when demanded.

II. HARDWARE SPECIFICATIONS

A. GPS Receiver (Sim28ml)

GPS stands for Global Positioning System and used to detect the Latitude and Longitude of any location on the Earth, with exact UTC time (Universal Time Coordinated). GPS module is used to track the location and instantaneous speed in our project. This device receives the coordinates from the satellite for each and every second, with time and date.

GPS module sends so many real time data in NMEA format. NMEA format consist several sentences, in which speed and coordinate related data is found in a particular sentence. This sentence starts from **$GPGGA** and contains the coordinates, time and other useful information. This **GPGGA** is referred to **Global Positioning System Fix Data**. The coordinates can be extracted from $GPGGA string by counting the commas in the string. Suppose to find $GPGGA string and it has to be stored in an array, then Latitude can be found after two

commas and Longitude can be found after four commas. Now, this latitude and longitude can be put in other arrays.

Below is the **$GPGGA** String, along with its description:

$GPGGA,104534.000,7791.0381,N,06727.4434,E,1,08,0.9,510.4,M,43.9,M,,*47

$GPGGA,HHMMSS.SSS,latitude,N,longitude,E,FQ,NOS,HDP,altitude,M,height,M,,checksum data

Identifier	Description
$GPGGA	Global Positioning system fix data
HHMMSS.SSS	Time in hour minute seconds and milliseconds format.
Latitude	Latitude (Coordinate)
N	Direction N=North, S=South
Longitude	Longitude(Coordinate)
E	Direction E= East, W=West
FQ	Fix Quality Data
NOS	No. of Satellites being Used
HDP	Horizontal Dilution of Precision
Altitude	Altitude (meters above from sea level)
M	Meter
Height	Height
Checksum	Checksum Data

Fig.1 GPS Receiver String

Fig. 2 GPS Module 28ML

B. GSM Modem (Sim900a)

The SIM900A is a complete Quad-band GSM/GPRS Module which can be embedded easily used by customer or hobbyist. SIM900A GSM Module provides an industry-standard interface. SIM900A delivers GSM/GPRS 850/900/1800/1900MHz performance for voice, SMS, Data with low power consumption. It is easily available in the market.

- SIM900A designed by using single-chip processor integrating AMR926EJ-S core
- Quad – band GSM/GPRS module in small size.
- GPRS Enabled

Fig. 3 GSM 900A Module

GSM/GPRS Modem-RS232 is built with Dual Band GSM/GPRS engine- SIM900A, works on frequencies 900/ 1800 MHz. The Modem is coming with RS232 interface, which allows you connect PC as well as microcontroller with RS232 Chip (MAX232). The baud rate is configurable from 9600-115200 through AT command. The GSM/GPRS Modem is having internal TCP/IP stack to enable you to connect with internet via

GPRS. It is suitable for SMS, Voice as well as DATA transfer application in M2M interface. The onboard Regulated Power supply allows you to connect wide range unregulated power supply. Using this modem, you can make audio calls, SMS, Read SMS; attend the incoming calls through simple AT commands.

C. Microcontroller (ATMEGA328P)

The Atmega328P provides the following features: 16 Kbytes of In-System Programmable Flash with Read-While-Write capabilities, 512 bytes of EEPROM, 1 Kbyte of SRAM, 23 general purpose I/O lines, 32 general purpose working registers, three flexible Timer/Counters with compare modes, internal and external interrupts, a serial programmable USART, a byte oriented Two wire Serial Interface, a 6-channel ADC (eight channels in TQFP and QFN/MLF packages) with 10-bit accuracy, a programmable Watchdog Timer with Internal Oscillator, an SPI serial port, and five software selectable power saving modes. The Idle mode stops the CPU while allowing the SRAM; Timer/Counters, SPI port, and interrupt system to continue the function.

Fig. 4 ATMEGA328P IC

D. Tachometer

A tachometer is a device used to measure the RPM or Revolutions per Minute of any rotating body. Tachometers can be contact based or non-contact ones. The non-contact or contact-less optical tachometers usually use laser or Infrared beam to monitor the rotation of any rotating body. This is done by calculating time taken for one rotation. An instrument which measures the working speed of an engine typically in revolutions per minute is known as Tachometer. There are many different types of tachometers however here the contactless reflection based IR optical tachometer is used.

III. SYSTEM MODULES & METHODOLOGY

A. Ambulatory Unit:

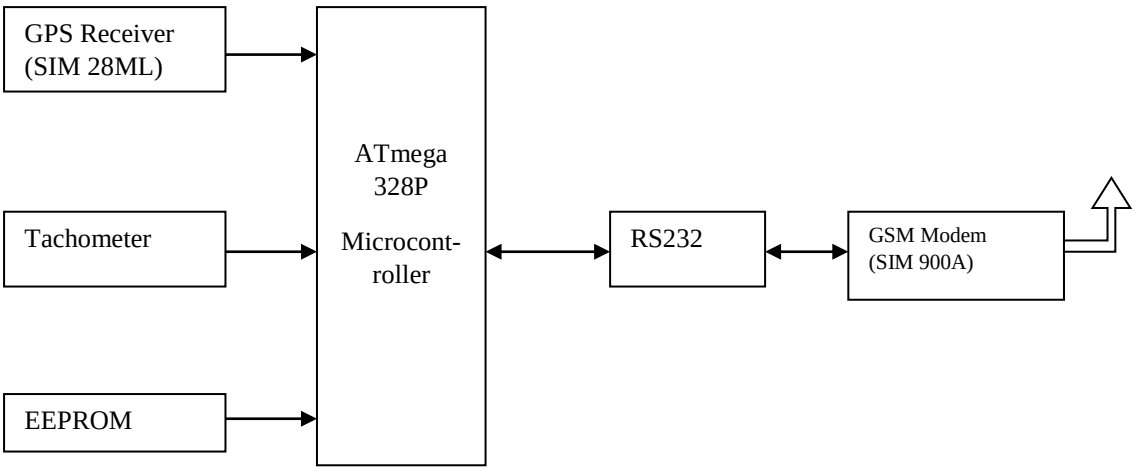
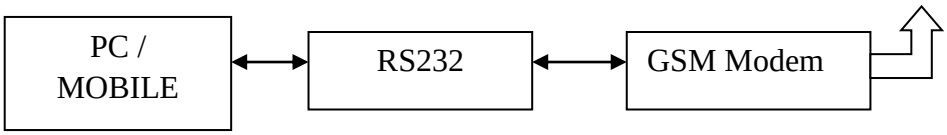


Fig. 5 Ambulatory Unit Incorporated In Vehicle

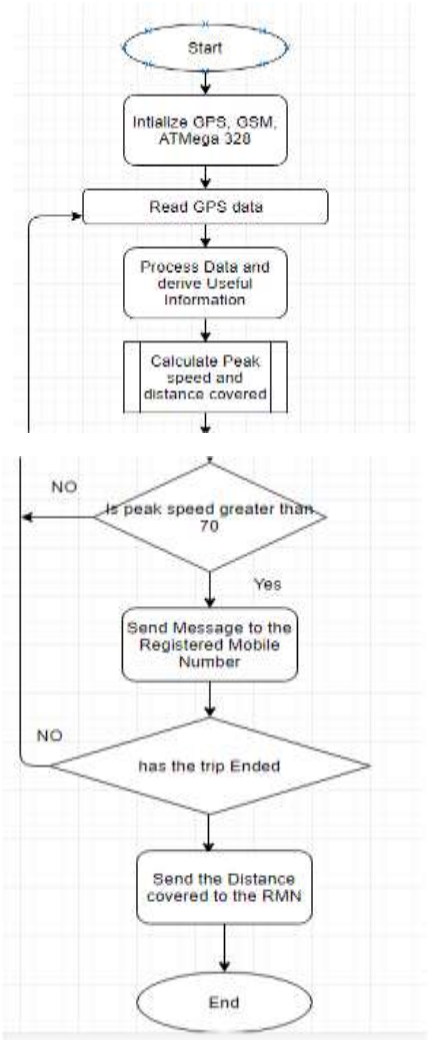
In this system it is proposed to design an embedded system which is used for tracking and positioning of any vehicle by using Global Positioning System (GPS) and Global system for mobile communication (GSM). Here Atmega328p microcontroller is used for interfacing to various hardware peripherals. For doing so an Atmega328p microcontroller is interfaced serially to GPS receiver i.e. SIM28ML and GSM module i.e. SIM900A. A GSM modem with a SIM card is used to send the required information of the vehicle from a remote place. The GPS receiver will continuously give the data i.e. the latitude & longitude and instantaneous speed of the vehicle. With the help of an additional circuitry known as Tachometer is used for the measurement

of distance being covered. The GPS receiver gives many parameters as the output, but only the NMEA (National Marine Electronics Association) data coming out is read and displayed. The microcontroller is programmed accordingly and gives the exact location, peak and Instantaneous speed and distance. The same data is sent to the mobile / laptop at the other end as well as displayed on the LCD. An EEPROM is used to store the data received by GPS receiver. The hardware interfaces to microcontroller are LCD display, GSM modem (SIM900A) and GPS Receiver (SIM28ML). In order to interface GPS receiver and GSM Modem to the controller, Arduino platform is used. A Program has been developed in Arduino which is used to locate the exact position of the vehicle and calculate peak and Instantaneous speed and distance of the vehicle. These four, namely data location (lat & lon), peak speed, distance travelled and Instantaneous speed are continuously updated to the registered cell number whenever demanded or the user access the manual push-button available on the vehicle.

B. Stable Unit:



This unit has again has the GSM modem for the communication with the ambulatory unit. The GSM modem receives the information of the vehicle sent from the other unit and with the help of serial communication protocol RS232 it transmit the same data to the registered PC or mobile.



IV. CONCLUSION

Commercial fleet operators are by far the largest users of vehicle tracking systems. These systems are used for operational functions such as routing, security, dispatch and collecting on-board information. These are also used in large vehicles like train, bus etc. because the vehicle like train contains large number of people and the sending of location and speed can save many lives.

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

- Fleet monitoring
- Vehicle scheduling
- Route monitoring
- Driver monitoring
- Rash Driving Monitoring
- Geo-fencing geo-coding

Vehicle tracking system makes better fleet management and which in turn brings large profits. Better scheduling or route planning can enable you handle larger jobs loads within a particular time. Vehicle tracking both in case of personal as well as business purpose improves safety and security, communication medium, performance monitoring and increases productivity. So in the coming year, it is going to play a major role in our day-to-day living.

Main motto of the paper is to incorporate compact, cheap and effective system so that they help in decrease the chances of losing life in accident due to rash driving which we can't stop from occurring. This vehicle tracking and monitoring feature plays much more important role in day to day life in future.

- 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 fire by connecting to the smoke detector.
- We can use our kit for detection of alcohol by connecting to the alcohol 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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