Real Time Vehicle Tracking And Controlling System

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Abstract—In this project we have implemented a vehicle tracking system using the wireless mobile communication network. We have used the Cell IDs to track a vehicle equipped with a cellular Subscriber Identity Module (SIM). Also at the user end we have implemented a GUI for ease of access and better data interpretation. Apart from tracking, the system can also be used for remote controlling of the vehicle. We have implemented the system on a low cost Atmega32 based system. Hence the system provides a low cost effective solution for remote tracking as compared to GPS.

I. INTRODUCTION

If you want to know; where your car or truck is, the routes and arrival of your fleet of vehicles, if someone is stealing your vehicle or if you want to protect your vehicle from thieves, a vehicle-tracking device can be of help. A vehicle tracking system will provide effective, real time vehicle location, mapping and reporting. This information also leads to higher profits through better fleet management. A vehicle tracking system will inform where your is at that particular time.

We are making the prototype of such a vehicle tracking system using the well known GSM technology. Our vehicle tracking system can track a vehicle by sending a simple sms using a GSM Module (or any mobile terminal that supports GSM). We can also control the vehicle by decelerating it if it is found to be in a suspicious or dangerous condition. Such a system can be implemented by a company manufacturing vehicle or security agencies responsible for theft. Our main aim is to make the vehicle owners secure about their vehicles.

II. METHODS OF VEHICLE TRACKING

There are broadly two methods of Vehicle Tracking which are broadly recognized. Each method has many variants and dialects. Selecting and implementing a particular method depends on various factors such as the accuracy required, time taken by that method etc. The methods are briefly explained below.

A. Vehicle Tracking Using GPS

A GPS tracking unit is a device that uses the Global Positioning System to determine the precise location of a vehicle, person, or other asset to which it is attached and to record the position of the asset at regular intervals. The recorded location data can be stored within the tracking unit, or it may be transmitted to a central location database, or internet-connected computer, using a cellular (GPRS), radio, or satellite modem embedded in the unit.

This allows the asset’s location to be displayed against a map backdrop either in real-time or when analyzing the track later, using customized software. A GPS tracking system uses the GNSS (Global Navigation Satellite System) network. This network incorporates a range of satellites that use microwave signals which are transmitted to GPS devices to give information on location, vehicle speed, time and direction. So, a GPS tracking system can potentially give both real-time and historic navigation data on any kind of journey.

B. Vehicle Tracking Using GSM

GSM based vehicle tracking system make use of a well known technology Global System for Mobile communication. In this kind of system, SMS can be sent through GSM Module using AT commands. Using the AT commands we can also retrieve the area ID and can send the area ID back in the form of message. GSM based vehicle tracking system make
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III. Method Implemented

In this project we have implemented GSM based vehicle tracking system. This method was selected because GSM is widely known and used technology. This method is very cheap as compared to GPS based technology, hence even a common man can also afford it. However, its accuracy is less then GPS based tracking but is sufficient enough in most of the cases.

IV. System Overview

Since our project is based on GSM system, our basic requirement is GSM Module or any GSM terminal. There should be a GSM Module with the user of the system as well as another GSM Module in the vehicle to be tracked. To control the operation of the GSM Module at the users side, we have used a PC connected to the GSM Module via the serial port. To control the GSM Module, application software in the controlling PC should be installed.

In the vehicle section, there will be a Atmega32 AVR microcontroller to control the operation of the GSM Module. Here, the microcontroller should be programmed to control messaging to and from GSM Module and to display the action performed by microcontroller. To the microcontroller, the decelerating circuitry will be connected. As we cannot show the actual mechanical braking system of a vehicle, we have used relays which resemble the ignition of the vehicle and motor turn on/off.

V. AT Commands

AT commands are the instructions used to control a modem. There are four types of AT command operations:

1) Test operation. A test operation is used to check whether a certain AT command is supported by the GSM/GPRS modem or mobile phone.
2) Set operation. A set operation is used to change the settings used by the GSM/GPRS modem or mobile phone for certain tasks.
3) Read operation. A read operation is used to retrieve the current settings used by the GSM/GPRS modem or mobile phone for certain tasks.
4) Execution operation. An execution operation is used to perform an action or retrieve information/status about the GSM/GPRS modem or mobile phone. Some of commands are explained below:

- Getting basic information about the mobile phone or GSM modem:
  - For example:
    - Name of manufacture: AT + CGMI
    - Model number: AT + CGMM
    - International Mobile Equipment Identity: AT + CGSN
  - Software Version: AT + CGMR

- Getting basic information about subscriber:
  - For example:
    - Mobile subscriber ISDN: AT + CNUM
    - International Mobile Subscriber Identity: AT + CIMI

- Current status of mobile phone:
  - For example:
    - Mobile phone activity status: AT + CPAS
    - Mobile network registration status: AT + CREG
    - Radio signal strength: AT + CSQ
    - Battery charge level: AT + CBS

- Establish data connection or voice connection to remote modem: ATD, ATA
- Send Receive FAX: ATD,ATA,AT+F*
- Read SMS messages: AT+CMGR,AT+CMGL
- Write SMS messages: AT+CMGW
- Delete SMS messages: AT+CMGD
- Read Phonebook entries: AT+CPBR
- Write Phonebook entries: AT+CPBW
- Search Phonebook entries: AT+CPBF

A. Syntax Of AT Commands Used In Project

1) AT+CPBR: Read phonebook entries
   Command: AT+CPBR=\<index1>,\<index2>\<CR>
   Example: AT+CPBR=1,100\<CR>(For reading first 100 entries)

2) AT+CMGS: This command is used to select SMS protocol data unit (PDU) mode or SMS Text mode.
   Command: AT+CMGF=\<mode>\<CR>
   Example: AT+CMGF=1\<CR>(For Text mode)
   AT+CMGF=0\<CR>(For PDU mode)
   Default:0

3) AT+CNMI: New Message Indications to TE Command
   Command: AT+CNMI=[\<mode>,\<mt>,\<bm>,\<ds>,\<bfr>]\<CR>
   Example: AT+CNMI=2,2,0,0,0\<CR>
   Default:0,0,0,0,0

VI. Hardware Design

Hardware consists of RF transmitter circuit and a receiver circuit with a microcontroller. RF transmitter transmits a particular code, representing a particular area. This RF code is received on a particular port of atmega32. Host GSM modem is connected to the PC, consisting of GUI made in VB. Whenever a GSM modem connected to microcontroller receives a code asking for an area ID, microcontroller transmits the byte received on that port in the form of message back to the host GSM modem. Host GSM modem can also transmit the code commanding the car to decelerate.
VII. GUI: [GRAPHICAL USER INTERFACE]

Host modem is connected to the user PC, which has GUI in it. This GUI is made in Visual basic 6.0 software. It is made up of two forms. First form is used for user verification.

It is required to enter the proper username and password for accessing the main form. This form is usually provided for security purpose. When a user enters appropriate username and password then a user gets access to the main form. This form is shown in the figure.

Various command buttons shown in the figure performs various tasks.

1) Get area ID: this command button is pressed whenever a user wants to know the area in which his/her vehicle lies.
2) Phonebook: this command button is pressed whenever a user wants to access the phonebook entries of sim card.
3) Decelerate: this command button is pressed whenever a user wants to decelerate the vehicle.
4) Rec En: this command button is pressed whenever a user wants to enable reception of messages.
5) Lock car: this command button is pressed whenever a user wants to lock his car.
6) Cancel: this command button will unload the form. And will terminate the session.

VIII. APPLICATIONS AND FUTURE SCOPE

GSM based vehicle tracking system can be used in varied applications. Some of them are listed below.

1) Logistics
2) Fleet Management
3) Commercial vehicle monitoring
4) Delivery and Courier Services
5) Public Transport Systems
6) Taxi Services
7) Emergency Vehicles and Security vehicles
8) Marine Navigation

This technology in conjunction with mechatronics can be implemented in real time vehicle tracking and controlling system. Also with the help of Free Google map and the use of HTTP protocol, location can be specified accurately and over a broader range.
IX. CONCLUSION

This paper presents a low cost real time vehicle tracking and controlling using GSM technology and a GSM modem, suitable for wide range of application over a world. Cost can be more reduced by interfacing a GSM mobile phone on both ends. Thus it eliminates extra burden of buying a GSM modem on user. It is expected that the full implementation of the proposed system would ultimately replace the traditional and costly GPS based system, which can be afforded by an average person.

REFERENCES

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