Vehicle Tracking System Using GPS and GSM Module

A.Chandana[1], Preethi Reddy[2], Ch. Sindhuja[3], Mrs. Ch. Rekha[4], Y.David Solomon Raju[5]

Abstract **:** *A vehicle tracking system is very useful for tracking the movement of a vehicle from any location at any time. An efficient vehicle tracking system is designed and implemented for tracking the movement of any equipped vehicle from any location at any time. The proposed system made good use of popular technology that combines a smart phone with an Arduino UNO. This easy to make and inexpensive compared to others. The designed in vehicle device works using Global Positioning System (GPS) and Global System for Mobile Communication (GSM) technology that is one of the most common ways for vehicle tracking. The device is embedded inside a vehicle those positions is to be determined and tracked in real time.*

An Arduino UNO is used to control the GPS receiver and GSM module. The vehicle tracking system uses the GPS module to get geographic coordinates at regular time interval. The GSM module is used to transmit and update the vehicle location to a database. This paper gives minute by minute update about vehicle location by sending SMS through GSM modem. This SMS contain latitude and longitude of the location of vehicle. Arduino UNO gets the coordinates from GPS modem and then it sends this information to the user in text SMS. GSM modem is used to send this information via SMS sent to the owner of the vehicle. Location is displayed on LCD. And then Google map displays location and name of the place on cell phone. Thus, user able to continuously monitor a moving vehicle on demand using smart phone and determine the estimated distance and time for the vehicle to arrive at a given destination.

Keywords: GPS, GSM, Arduino UNO, SMS, LCD.

* Correspondence Author
T.Chandana[1]
Preethi Reddy[2]
Ch. Sindhuja[3]
[1,2,3]UG Student, Department of ECE,
Holy Mary Institute Of Technology And Science, Bogaram(V) Keesara(M), Medchal-501301
Mrs. Ch. Rekha[4]
[4]Assistant Professor, Department of ECE,
Holy Mary Institute Of Technology And Science, Bogaram(V) Keesara(M), Medchal-501301
Y.David Solomon Raju[5]
[5]Associate Professor, Department of ECE,
Holy Mary Institute Of Technology And Science, Bogaram(V) Keesara(M), Medchal-501301

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1. INTRODUCTION

This Paper presents an automotive localization system using GPS and GSM-SMS services. The system permits localization of the automobile and transmitting the position to the owner on his mobile phone as a short message (SMS) at his request. The system even controls the ignition of the vehicle using DC motor.

The system can be interconnected with the vehicle and alert the owner on his mobile phone. This tracking system is composed of a GPS receiver, ARDUINO and a GSM Modem. GPS Receiver gets the location information from satellites in the form of latitude and longitude. The Arduino processes this information and this processed information is sent to the user/owner using GSM modem. The system also controls the ignition of the vehicle.

The Arduino Uno is a microcontroller board based on the ATmega328. It has 14 digital input/output pins (of which 6 can be used as PWM outputs), 6 analog inputs, a 16 MHz ceramic resonator, a USB connection, a power jack, an ICSP header, and a reset button. It contains everything needed to support the microcontroller; simply connect it to a computer with a USB cable or power it with a AC-to-DC adapter or battery to get started.

The presented application is a low-cost solution for automobile position and status, very useful in case of car theft situations, for monitoring adolescent drivers by their parents as well as in car tracking system applications. The system also controls the ignition of the vehicle using DC motor. The proposed solution can be used in other types of application, where the information needed is requested rarely and at irregular period of time (when requested).

1.1 Components Description

Arduino UNO: The Arduino Uno is a microcontroller board based on the ATmega328 (datasheet). It has 14 digital input/output pins (of which 6 can be used as PWM outputs), 6 analog inputs, a 16 MHz crystal oscillator, a USB connection, a power jack, an ICSP header, and a reset button. It contains everything needed to support the microcontroller; simply connect it to a computer with a USB cable or power it with an AC-to-DC adapter or battery to get started. The Uno differs from all preceding boards in that it does not use the FTDIUSB-to-serial driver chip. Instead, it features the Atmega8U2 programmed as a USB-to-serial converter. "Uno" means one in Italian and is named to mark the upcoming release of Arduino 1.0. The Uno and version1.0 will be the reference versions of Arduino, moving forward. The Uno is the latest in a series of USB Arduino boards, and the reference model for the Arduino platform; for a comparison with previous versions.

Regulated Power Supply: Power supply is a supply of electrical power. A device or system that supplies electrical or other types of energy to an output load or group of loads is called a power supply unit or PSU. The term is most commonly applied to electrical energy supplies, less often to mechanical ones, and rarely to others. A power supply may include a power distribution system as well as primary or secondary sources of energy such as. Conversion of one form of electrical power to another desired form and voltage, typically involving converting AC line voltage to a well-regulated lower-voltage DC for electronic devices. Low voltage, low power DC power supply units are commonly integrated with the devices they supply, such as computers and household electronics.

- Batteries.
- Chemical fuel cells and other forms of energy storage systems.
- Solar power.
- Generators or alternators.

Global System for Mobile Communication: GSM, which stands for Global System for Mobile communications, reigns (important) as the world's most widely used cell phone technology. Cell phones use a cell phone service carrier's GSM network by searching for cell phone towers in the nearby area. Global system for mobile communication (GSM) is a globally accepted standard for digital cellular communication.

GSM is the name of a standardization group established in 1982 to create a common European mobile telephone standard that would formulate specifications for a pan-European mobile cellular radio system operating at 900MHz. It is estimated that many countries outside of Europe will join the GSM partnership.

Modem Specifications: The SIM300 is a complete Tri-band GSM solution in a compact plug-in module. Featuring an industry-standard interface, the SIM300 delivers GSM/GPRS900/1800/1900Mhz performance for voice, SMS, data and Fax in a small form factor and with low power consumption. The leading features of SIM300 make it deal fir virtually unlimited application, such as WLL applications (Fixed Cellular Terminal), M2M application, handheld devices and much more.

> ➤ Tri-band GSM/GPRS module with a size of 40x33x2.85
> ➤ Customized MMI and keypad/LCD support
> ➤ An embedded powerful TCP/IP protocol stack

Based upon mature and field proven platform, backed up by our support service, from definition to design and production.

General Features:

- ✓ Tri-band GSM/GPRS900/1800/1900Mhz
- ✓ GPRS multi-slot class 10
- ✓ GPRS mobile station class –B
- ✓ Complaint to GSM phase 2/2+
- ✓ -class 4(2W @900MHz)
- ✓ -class 1(1W @/18001900MHz)
- ✓ Dimensions: 40x33x2.85 mm
- ✓ Weight: 8gm
- ✓ 7. Control via AT commands
- ✓ (GSM 07.07, 07.05 and SIMCOM enhanced AT commands)
- ✓ SIM application tool kit
- ✓ supply voltage range 3.5…….4.5 v
- ✓ Low power consumption
- ✓ Normal operation temperature: -20 'C to +55 'C
- ✓ Restricted operation temperature: -20 'C to -25 'C and +55 'C to +70 'C
- ✓ storage temperature: -40 'C to +80 'C

Global Positioning System: The Global Positioning System (GPS) is a U.S. space-based radio navigation system that provides reliable positioning, navigation, and timing services to civilian users on a continuous worldwide basis -- freely available to all. For anyone with a GPS receiver, the system will provide location and time. GPS provides accurate location and time information for an unlimited number of people in all weather, day and night, anywhere in the world. The Global Positioning System (GPS) is a satellite-based navigation system made up of a network of 24 satellites placed into orbit by the U.S. Department of Defense. GPS was originally intended for military applications, but in the 1980s, the government made the system available for civilian use. GPS works in any weather conditions, anywhere in the world, 24 hours a day. There are no subscription fees or setup charges to use GPS. The GPS is made up of three parts: satellites orbiting the Earth; control and monitoring stations on Earth; and the GPS receivers owned by users. GPS satellites broadcast signals from space that are picked up and identified by GPS receivers. Each GPS receiver then provides three-dimensional location (latitude, longitude, and altitude) plus the time.

 Individuals may purchase GPS handsets that are readily available through commercial retailers. Equipped with these GPS receivers, users can accurately locate where they are and easily navigate to where they want to go, whether walking, driving, flying, or boating. GPS has become a mainstay of transportation systems worldwide, providing navigation for aviation, ground, and maritime operations. Disaster relief and emergency services depend upon GPS for location and timing capabilities in their life-saving missions. Everyday activities such as banking, mobile phone operations, and even the control of power grids, are facilitated by the accurate timing provided by GPS. Farmers, surveyors, geologists and countless others perform their work more efficiently, safely, economically, and accurately using the free and open GPS signals.

DC Motors: At the most basic level, electric motors exist to convert electrical energy into mechanical energy. This is done by way of two interacting magnetic fields -- one stationary, and another attached to a part that can move. A number of types of electric motors exist, but most BEAM bots use DC motors in some form or another. DC motors have the potential for very high torque capabilities (although this is generally a function of the physical size of the motor), are easy to miniaturize, and can be "throttled" via adjusting their supply voltage. DC motors are also not only the simplest, but the oldest electric motors.
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LCD Display: One of the most common devices attached to a micro controller is an LCD display. Some of the most common LCD's connected to the many microcontrollers are 16x2 and 20x2 displays. This means 16 characters per line by 2 lines and 20 characters per line by 2 lines, respectively. The LCD requires 3 control lines as well as either 4 or 8 I/O lines for the data bus. The user may select whether the LCD is to operate with a 4-bit data bus or an 8-bit data bus. If a 4-bit data bus is used the LCD will require a total of 7 data lines (3 control lines plus the 4 lines for the data bus).

If an 8-bit data bus is used the LCD will require a total of 11 data lines (3 control lines plus the 8 lines for the data) The three control lines are referred to as **EN**, **RS**, and **RW**.The **EN** line is called "Enable." This control line is used to tell the LCD that we are sending it data. To send data to the LCD, our program should make sure this line is low (0) and then set the other two control lines and/or put data on the data bus.

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2. Block Diagram and Working

GPS and GSM based vehicle tracking system explains the interfacing section of each component with ARDUINO. GSM is connected to 9th and 10th pins of Arduino UNO and GPS is also connected to 4th, 3rd pins of Arduino UNO and DC Motor also connected to 13th pin of Arduino. Here DC Motor represent vehicle.
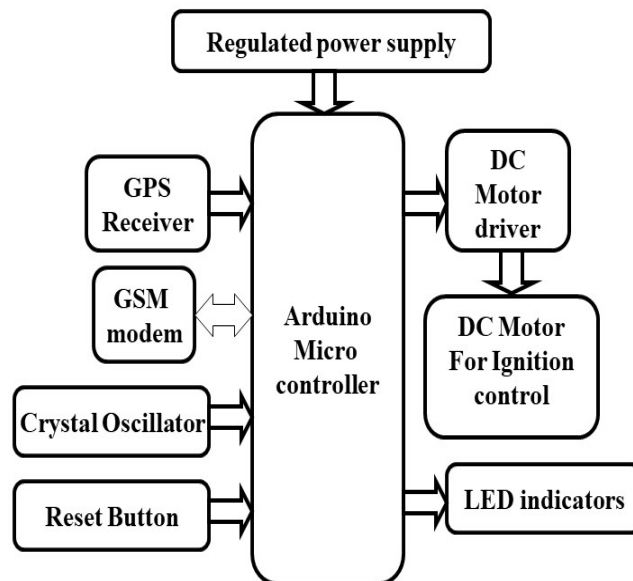

Vehicle tracking by GPS - GSM consists of aArduino, GPS module, and GSM modem and 9V DC power supply. The whole system is attached to the vehicle. PS module gets the location information from satellites in the form of latitude and longitude. The Arduino processes this information and sends it to the GSM modem. The GSM modem then sends the information to the owner's mobile phone. So the GPS system will send the longitudinal and latitude values corresponding to the position of vehicle to GSM Modem.

GPS- GPS uses the satellite data to calculate an accurate position on the planet earth. The calculations made by GPS can help relate the user's location to almost any map paper ion within a few milli-seconds. All GPS modules work in an analogous manner but they often look very diverse and have different software. The most noteworthy difference between GPS receivers is the given number of available satellites they can instantaneously communicate with. Most receivers are designated as 12 channels i.e. they can interconnect with 12 satellites.

GSM- The GSM shield by Arduino is used to send or receive messages and make or receive calls just like a mobile phone by using a SIM card of any network provider. We can do this by plugging the GSM shield into the given Arduino board and then plugging in a SIM card from any operator that offers the GPRS coverage. We can communicate easily with the shield using the available commands. The GSM library contains the various methods of communication with the shield. This GSM Modem can then work with any GSM network operator SIM card just like an ordinary mobile phone with its own 10-digit unique phone number. The advantage of using this modem is that its RS232 port can be used to interconnect and develop various embedded applications.

Result: Initially, when no power supply is applied to the device. It means it cannot send any information to the mobile regarding the vehicle's location.
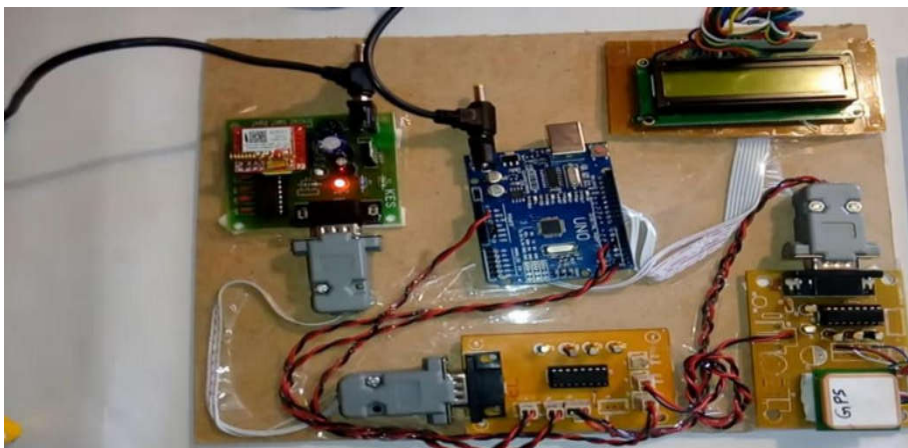
When power supply is given to the device through two 9v adapters to the arduino and GSM, then the system shows ready on the LCD display to track the location.
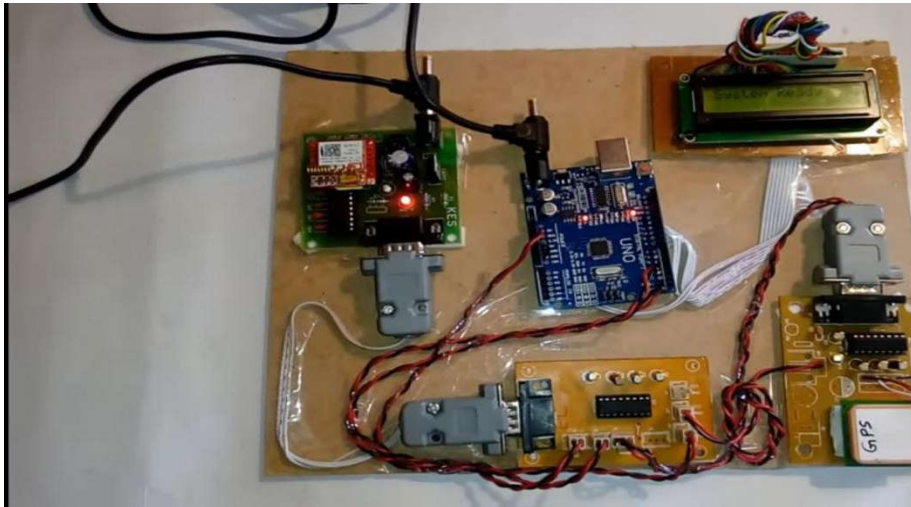
The vehicle tracking system works mainly by receiving messages from a mobile phone. There is a message command by which we can track the vehicle. And this command is to send an SMS; "TRACK VEHICLE" to the registered SIM card number in the GSM modem. This command initiates the GPS modem and receives the latitude and longitude position and this information will then be sent as SMS to the mobile device.
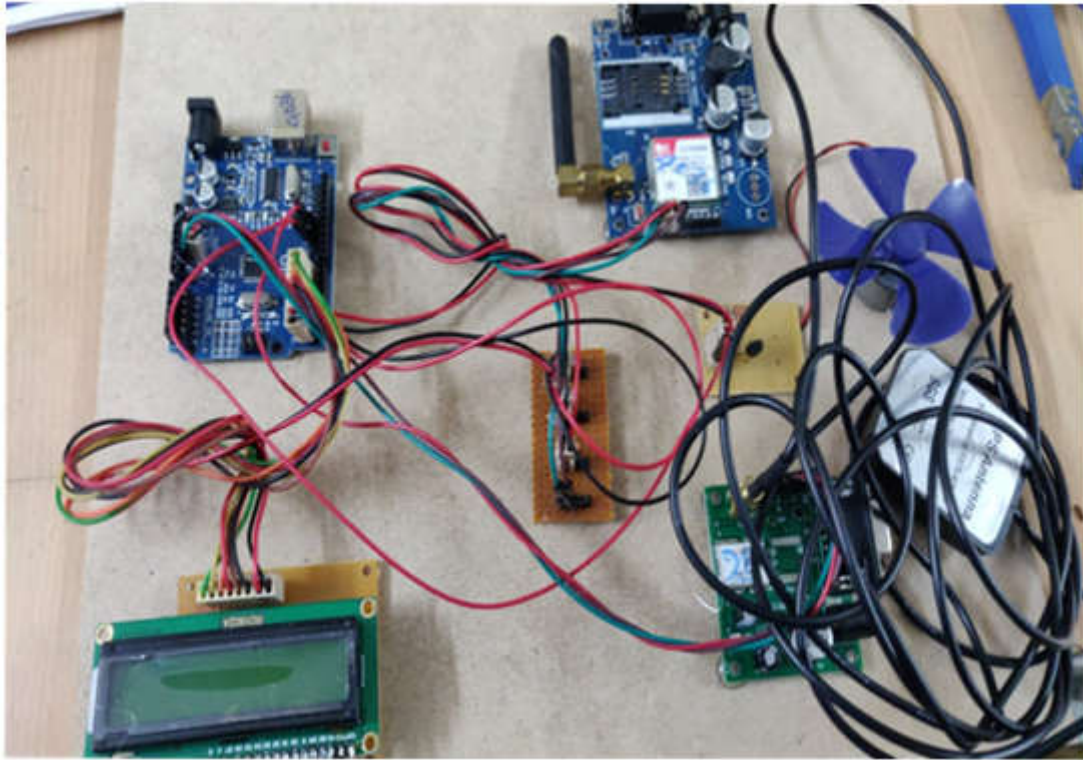

The device sends a message to the vehicle owner's mobile device as shown below. Vehicle tracking alert:
Your vehicle current location is:
Latitude: 1725.6480
 a) Longitude: 07835.1127

Working Model of the Kit:

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Conclusion:

Integrating features of all the hardware components used have been developed in it. Presence of every module has been reasoned out and placed carefully, thus contributing to the best working of the unit. Secondly, using highly advanced IC's with the help of growing technology, the paper has been successfully implemented.

The paper titled "Vehicle tracking system using GPS and GSM module" is a model for vehicle tracking unit with the help of GPS receivers and GSM modem. Vehicle Tracking System resulted in improving overall productivity with better fleet management that in turn offers better return on your investments. 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. We have completed the paper as per the requirements of our paper. Finally the aim of the paper i.e. to trace the vehicle is successfully achieved.

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