

Vehicle Tracking System Using GPS and GSM Technology

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Abstract — Vehicle security has been becoming an important issue everywhere. So for secured transportation, an efficient vehicle tracking system is designed for tracking exact location of vehicle by the owner. The system consist of GPS, GSM technology and mobile application with a microcontroller. The device is embedded inside a vehicle whose position is to be determined and tracked in real time. The microcontroller is the heart of the system which controls the GSM and GPS module. The GPS module is use to get coordinates at every time intervals. The GSM module is use to receive and transmit the message to and from user's or owner's mobile. The mobile is used to see the received location coordinates on goggle map. In order to show the feasibility and effectiveness of the system, this paper presents experimental results of vehicle tracking system.

Key Words — Vehicle Tracking System, microcontroller, goggle maps, smartphone application, GPS and GSM technology

I. INTRODUCTION

In the last few decades, India has progressed at such an enormous rate that many companies have strongly established themselves here. These companies bring a huge amount of workforce with them. Generally, the transport is arranged through the local vendors on a yearly contract basis, recently happen mishaps such as burglary, rape cases, etc.

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 common person. Today GPS used in cars, ambulances, fleets and police vehicles are common sight on the road 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 GPS and GSM systems and the wide usage of them by millions and people throughout the world.

This system designed for users in land construction and transport business, provides real time information such as location, speed and expected arrival time of 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 their safety as travelling. This vehicle tracking system found in clients vehicles as a theft prevention and rescue device. This system installed for four wheelers, vehicle tracking usually used in navy operators for navy management functions, routing, and send off, on board information security. The application include monitoring driving performance of a parent with a teen driver. Vehicle tracking system accepted in consumer vehicles as a theft prevention and retrieval device.

II. BLOCK DIAGRAM

In the development of Vehicle Tracking system controlled by microcontroller, hardware and software design techniques are needed.

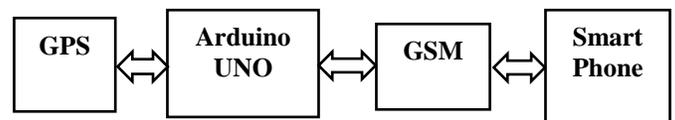


Fig.a. Block diagram of Vehicle Tracking System.

Above fig shows the block diagram of Vehicle Tracking System. It consist of four blocks i.e. GPS, Arduino UNO, GSM, smartphone. GPS is connected to Arduino.

Arduino takes string from GPS and extract the longitude and latitude continuously at every instant of time. When smartphone send message to GSM for tracking the vehicle, the GSM send the extracted coordinates of that particular time to the smartphone.

III. IMPLEMENTATION DETAILS

A. Arduino Microcontroller

Atmega 328 based Arduino UNO microcontroller is used as the brain to control the vehicle tracking system. It is an open source software (IDE) makes it easy to write code and upload it on the micro controller board. It runs on various platform like Windows, Mac, and Linux. A software program to control them written in C language, compiled, and burn into the microcontroller flash memory.

It has 14 digital input-output pins (of which 6 are use as PWM outputs), 6 analog pins, a 16MHz quartz crystal, a USB connection, a power jack and reset button.

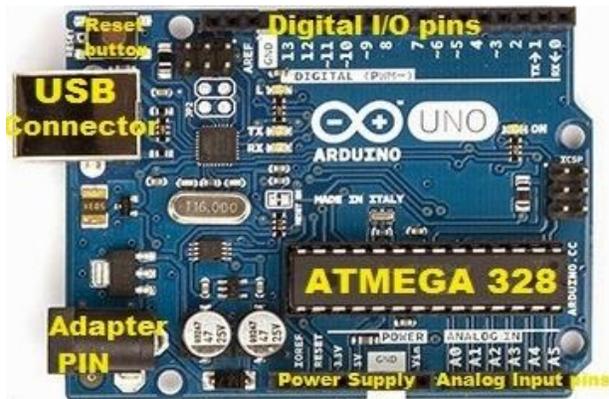


Fig.a. Arduino UNO

B. GPS module

The Global Positioning System in vehicle tracking system, is commonly used to provide user the location coordinates from anywhere on the earth. The GPS module has the GPS receiver with the antenna. GPS use satellite data to calculate an accurate position on the earth. These calculation can relate the user position to almost mapped projection within milliseconds. All GPS works in a similar manner but have different look and software. GPS signal do not contain positional data. The position received by receiver on the ground is calculated position based on range-finding triangulation. GPS position is achieved by measuring the time taken by a signal to reach the receiver. Almost one million times a second the satellite transmits one or zero in a complex string of digits that appears random.

When the receiver has to determine the time, the distance to the satellite can be calculate using trigonometric i.e. Distance to satellite = $c * (T_r - T_{T_0})$

Where, c = speed of light in free space.

T_r = time at receiver.

T_{T_0} = time at the origin.

The number of satellite a GPS receiver can talk to at one time affect the accuracy and the speed at which the system can function. Twelve channels are most commonly used receivers today and are both quicker and more accurate.



Fig.b. GPS

C. GSM

The Global System of Mobile is use for receiving and transmitting message between user and Vehicle Tracking System by means of SMS. In this system, GSM SIM300 is used which works on various frequencies i.e. EGSM 900 MHz, DCS 1800 MHz and PCS 1900 MHz. The GSM modem is a specialized type of modem which accepts a SIM card operates on a subscriber's mobile number over a network, just like a cellular phone. The communication between arduino and GSM is serial so serial pins Rx and Tx is used for receiving and transmitting the message. AT commands are used in GSM for controlling some functions.

Booting the GSM module:

1. Insert the SIM card to GSM module and lock it.
2. Connect the adapter to GSM module and turn it on.
3. Now wait for some time and wait to see the rate of blinking of the network LED.
4. When the connection is established successfully, the network LED will blink continuously at every 3 sec.



Fig. GSM

IV. FLOW CHART OF SYSTEM

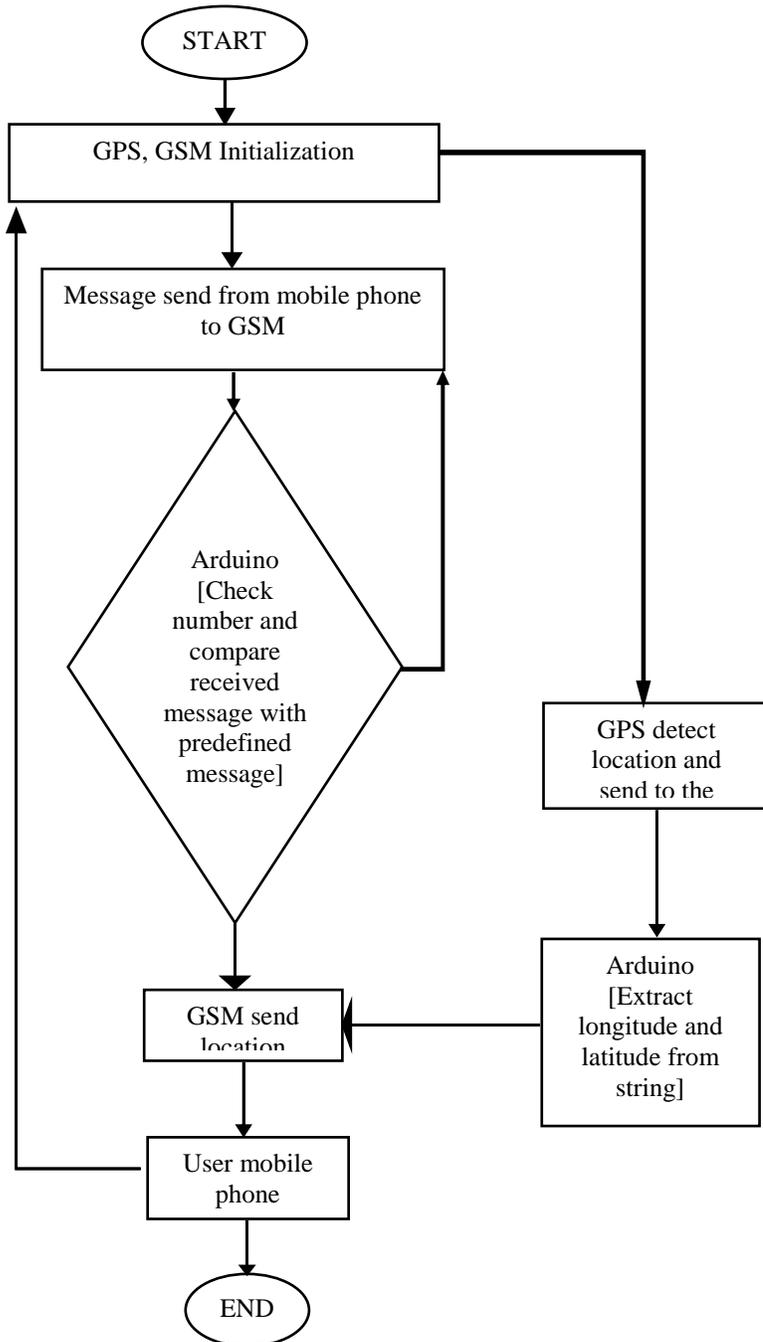


Fig. Flow chart of overall system.

V. WORKING

In the system, multiusers can communicate with vehicle tracking system for monitoring the exact location of vehicle. Arduino is used for controlling whole process with GSM and GPS. Where GSM (Global system for mobile) is used for the communication purpose and GPS (Global positioning system) is used for detecting the location of vehicle. When our system is programmed completely, then install it in vehicle and power it up. This will initialize the GSM and GPS by setting the baud rate. The GPS receiver will receive the location in the form of string from the satellite. This string is passed to the arduino which will extract the coordinates from the string at every instant of time. If location of vehicle is to be tracked then user need to transmit a SMS (i.e. "@5#") to the system which is in vehicle. GSM will transmit the received SMS to the arduino for verifying the users number and the received message. The Arduino will check the number from which the message is received is valid or not that means the number is from authorized person. If not then system will not do anything. And if the number is valid then it will compare the received SMS with predefined SMS stored in the program. If it matches with predefined SMS, then arduino will transmit the coordinates to the user through GSM with the hyperlink. When user tap on the received hyperlink then it will take user to goggle map which will give the accurate location of the vehicle.

VI. RESULT

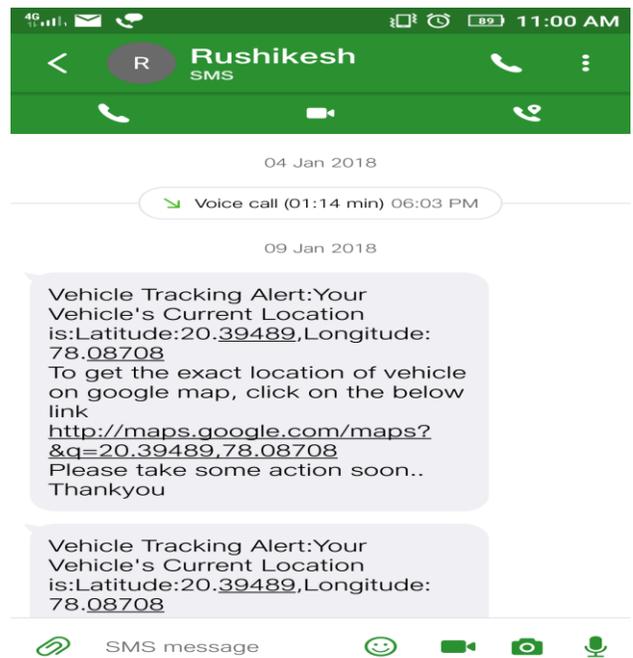


Fig. SMS received from the Vehicle Tracking System to the user.



Fig. Location on goggle map.

CONCLUSION AND FUTURE WORK

Here arduino UNO microcontroller is used for controlling whole process. The vehicle tracking system can track the exact location of the vehicle. The user can see the location whenever needed at any time. This system can use for tracking or monitoring in various field such as kids monitoring, woman's safety, labor safety, and on those field where security is most important parameter. It can be used in detection of stolen vehicle.

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