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GPS and GSM based vehicle tracking system using arduino

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ABSTRACT

Global positioning system (GPS) and Global system for mobile communication (GSM) modules-based vehicle tracking system using Arduino. Vehicle tracking system installed in the vehicle, to track our vehicle position on electronic maps using internet and locking the fuel. When the theft identified, the responsible person send SMS to the Arduino, then Arduino issue the control signals to stop the fuel. Authorized person need to send the password to Arduino to restart the vehicle. And also detect the accident using vibration sensor. This is more secured, and reliable.

Index Terms: Vehicle tracking system, Accident Protection, Locking system, Arduino, GPS, GSM.

INTRODUCTION

A GPS tracking unit is a navigation device, normally carried by a moving vehicle that uses the Global Positioning System (GPS) to track the device's movements and find out its location.

In this system we are using the Global System for Mobile Communication module for sending the coordinates of vehicle on mobile phone via message. Global Positioning System is sends the coordinates continuously. After reading this data using Arduino extract the required data and then sends it to mobile phone using GSM module via message.

Global Positioning System is used for tracking the vehicle. This proposed system provides a vehicle tracking system with maximum accessibility for the user anytime and anywhere. The system's tracking services includes acquiring the location of a given vehicle in the current moment. Tracking vehicles in our system uses a wide range of new technologies and communication networks including, Global System for Mobile Communication (GSM), the Internet and Global Positioning System (GPS).

Users can install this system in their vehicles and use it without any difficulty. It is active for any

mobile phone that can use Google Maps, and send and receive message. The vehicle tracking system consist of two parts: hardware and the software. The hardware consists of five units: a Arduino, a GSM modem, a GPS modem, a vibrating Sensor and a servo motor. The first important component of the hardware is the Arduino, which is the brain of this system. All hardware units connect to the Arduino. The second device is the Global System for Mobile Communication modem. This device is used to connect to the network and is responsible for sending and receiving instructions. The third device in the system is the Global Positioning System modem. This device is determined the vehicle location and sending this information to the vehicle owner's mobile phone via internet. The fourth device is the Vibrating Sensor. It is used to detect the accident. The fifth device in the system is the servo motor. This device is act as a locking device. It is used to block and unblock the fuel supply to the engine. The second part of this system is software. The purpose of the software is to control the system.

It has been explored that most of the GPS and GSM based vehicle tracking systems are user-friendly, cost effective, and reliable. The tracking

system will be better for vehicle that can be traced using GPS vehicle tracking.

OBJECTIVE

The main objective of our project is track and location of vehicle and it provides security system for the vehicle. The system also used to protect the vehicle from the accident and prevent the vehicle theft. And also provide the locking device and it blocks the fuel supply to the engine.

LITERATURE SURVEY

“A Review on Vehicle Tracking and Accident Detection System using Accelerometer” B.Rani-2018

This system helps to retrieve the exact position of the vehicles and sends an automated message to all the pre-install numbers in the device. Exact position of the vehicles can be acquired by the help of the Global Positioning System. Global System for Mobile Communication is used to send and receive the message to the various people of the accident that has happened. The micro-controller coordinates with all the modules and helps sending the message. The signal is received the micro controller then sends the result according to its programming.

“Real Time Vehicle Locking and Tracking System using GSM and GPS Technology-An Anti-theft System”

Pravada P. Wankhade - 2011

This project design & development of a theft control system for an automobile, which is being used to prevent or control the theft of a vehicle. This system makes use of an embedded system based on

GSM technology. The microcontroller unit reads the sms and sends it to the GPS module and using the triangulation method, GPS module feeds the exact location in the form of latitude and longitude to the user's mobile. By reading the signals received by the mobile, one can control the ignition of the engine; say to lock it the engine immediately.

PROCEDURE

The vehicle tracking system consists of a GPS modem that generates the coordinates, a GSM modem for receiving requests from the user and sending the coordinates of the vehicle generated by the GPS modem via SMS, an Arduino as an interface and a mobile application based on Google maps to point out the location of the vehicle. The following sections explain in detail each element of the system.

Interface

Arduino is an open-source electronic device based on easy-to-use hardware and software. More convenient power management and built-in voltage regulation. You can connect an external power source up to 12v. It will regulate it both 5v and 3.3v. It also can be powered directly off to a USB port without any external power.

An easy-to-find, and dirt cheap, it has countless number of hardware features like timers, PWM pins, internal and external interrupts, and multiple sleep modes.

The device has 16MHz clock pulse. The storing capacity is 32 KB of flash memory. It has 13 digital pins and 6 analog pins and it allows you to connect external hardware to your Arduino.



Fig: Arduino UNO

Generating Coordinates

Global Positioning System coordinates are most commonly expressed as latitude and longitude. This system divides the earth into longitude lines, which indicate how far east or west of the prime meridian a location is and latitude lines, which indicate how far south or north of the equator a location is.

In this system, the equator is at 0 degrees latitude, with the poles being at 90 degrees south and north. The prime meridian is at 0 degrees longitude, extending west and east.

GPS provides satellite, which are processed by a receiver. The positions can even be computed in three-dimensional views with the help of 3 or 4 GPS satellite signals. The Space Segment of the GPS consists of 27 Earth-orbiting GPS satellites.

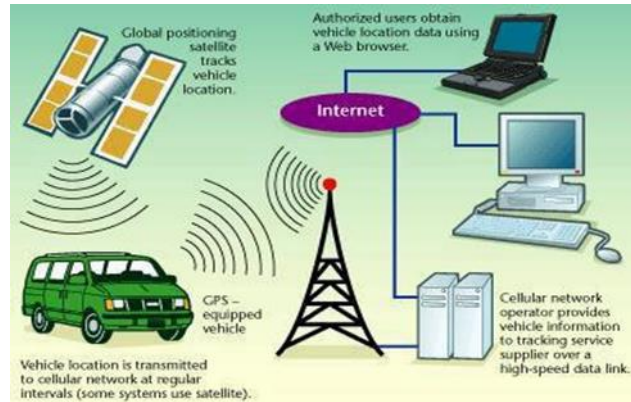


Fig: GPS tracking system

There are 24 operational and 3 extra satellites that move round the Earth each 12 hours and send

radio signals from space that are received by the GPS receiver.



Fig: Longitude and Latitude

Under this system, an exact location on the earth's surface can be acted as a set of numbers. The location may also be expressed only number format, per: 40.748440, -73.984559. Thus, the first number indicating latitude, and the second number representing longitude. Being numeric-only, the second means of notation is the most commonly used for inputting positions into Global Positioning System devices.

Sending/Receiving SMS

GSM is an open and digital cellular technology used for transmitting message and data services operates at the 850MHz, 900MHz, 1800MHz and 1900MHz frequency bands. Global System for Mobile Communication system was developed as a digital system using time division multiple access technique for communication purpose. A GSM

device using a serial cable or a USB cable. It acts as similar to a GSM mobile phone, and also GSM modem requires a SIM card for operation. There are two types of AT commands:

- Basic commands
- Extended commands



Fig: GSM module

Basic commands

AT commands that do not start with “+”.

Example

- D (Dial)
- A (Answer)
- H (Hook control)
- (Return to online data state)

Extended commands

AT commands that start with “+”. All GSM AT commands are extended commands.

Example

+CMGS (Send SMS message)□
 +CMSS (Send SMS message from storage)□ □ +CMGL (List SMS messages)□ □ +CMGR (Read SMS messages)

Performance of GSM

- It can read, write and delete SMS message
- It can start sending SMS message□
- It can reply to an SMS message□

Features of GSM

- It can be interfaced to system using USB cable
- Input voltage 5v to 30v□
- Programmable with AT commands□

Existing system

In this existing system is designed with GPS modem which tracks the location of vehicle in terms of its longitude and latitude. This information is fed to the microcontroller which is connected with a GSM module. Microcontroller saves the location details and send it to the worried authority in the form of SMS over GSM. An LCD is connected to the microcontroller for over pass the information received before being sent over GSM. This does not prevent the vehicle theft as much as possible.

Block diagram

The microcontroller is used to control the entire function of the system. And the display is connected to the microcontroller it acts as the displaying the values of longitude and latitude. The GPS is track the vehicle location and the GSM is used for sending the coordinates to user by message.

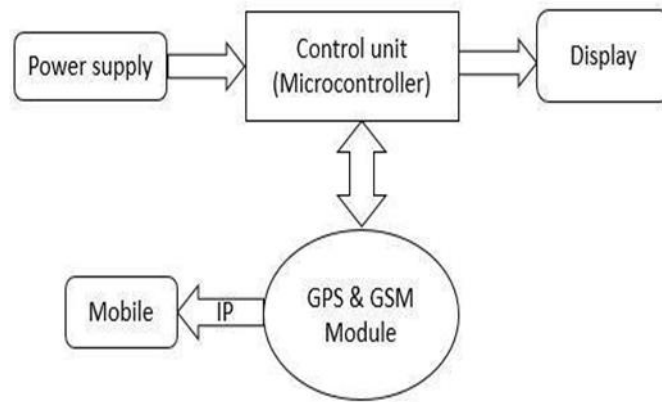


Fig: Block diagram of existing system

Drawbacks of existing system

- The existing system does not prevent the vehicle theft□
- Does not provide any security system□
- Its only monitoring and tracking the vehicle□

PROPOSED SYSTEM

In this proposed system is design and implemented for tracking the location of vehicles and prevent the vehicle theft. Now-a-days, the protection of vehicles is very necessary for public transportation. This tracking system is sent us the geographical coordinates and the GPS receives the coordinates from the satellite for each and every second.

By using these coordinates we can track our vehicle position on electronic map via internet. The proposed system gives solution for the existing problems like vehicle theft and it also

gives protection for the vehicles. It also is used for accident detection alert system.

Block diagram

In this project, Arduino is used for controlling whole the process with a GPS and GSM module. LCD is also used for displaying the initiation to ready. GPS Receiver is used for detecting coordinates of the vehicle, GSM module is used for sending the coordinates to user by message.

Then we just need to send an SMS, “Track Vehicle”, to the system that is placed in our vehicle. Sent message is received by GSM module and sends message data to Arduino. This message contains the coordinates of vehicle location.

Then, the vibrating sensor is used to protection of accident and the lock set up is used for servo motor. It will act as block the fuel supply to the engine.

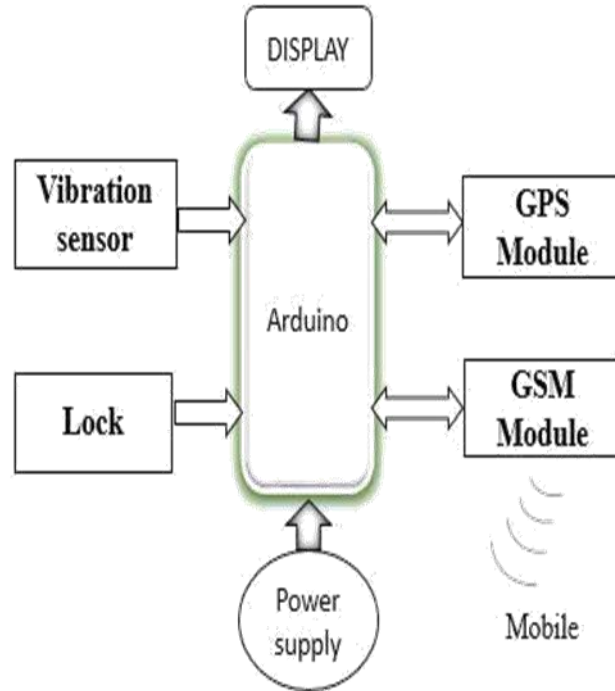


Fig: Block diagram of proposed system

Circuit diagram

It is designed to Arduino Uno board (BOARD1), 16×2 LCD (LCD1), GPS module, GSM module vibrating motor and servo motor.

In circuit diagram, GPS module's Tx pin is directly connected Rx pins of Arduino and Rx pin of GSM is directly connected to Tx pin of Arduino. And LCD display is also connected with Arduino for displaying initiate to ready.

By using Software Serial Library here, we have allowed serial communication on pin 11 and 10, and made them Tx and Rx respectively and left the Rx pin of GPS Module open. The GPS Module powered by using 12 volt supply. GSM module's Rx and Tx pins of are directly connected to pin Tx and Rx of Arduino. GSM module also 12v supply is used to power. Arduino's pins 5, 4, 3 and 2 are connected to data pin number D4, D5, D6 and D7 of LCD display. Command pin EN and RS of LCD are connected with pin number 3 and 2 of Arduino

and RW pin is directly connected with ground. A Potentiometer is also used for setting contrast of LCD.

Track the vehicle by using SIM card inserted in the GSM module. To track the vehicle, send an SMS to the SIM card by typing "Track Vehicle" from user mobile phone.

After sending the message, wait for a few seconds until you receive location detail of the SIM card in the form of latitude and longitude with Google map on your mobile phone. And also find the exact location.

The vibrating sensor is connected to the Arduino. The range of vibrating level is high it detects the accident and to send the message from user mobile phone.

And finally, the servo motor is connected to the Arduino that is used to purpose of block and unblock the fuel supply to the engine.

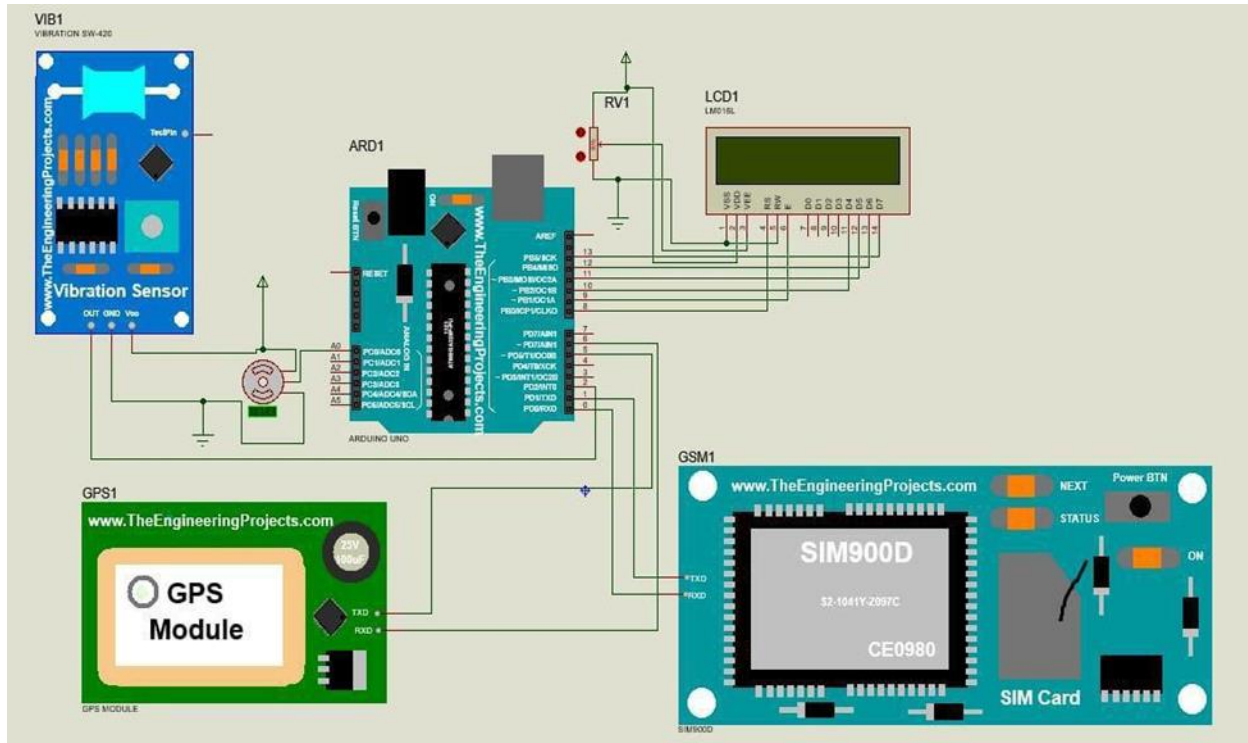


Fig: Circuit Diagram

RESULT

Whenever accident or theft of the vehicle is occurred then the device sends message to given mobile device.

Message for theft

“Track
Latitude: 2400.0090, N
Longitude: 12100.0000, E
Time: 12:00”

Message for accident

“Accident alert
Latitude: 2400.0090, N
Longitude: 12100.0000, E

Time: 12:00”

This system shows the location of vehicle on the LCD connected to it also just to make sure the working condition of the Arduino.

CONCLUSION

Proposing a tracking system which may use to track the location of vehicle with help of GPS and also help the community decreasing the death rates resulting from vehicles accidents by using Global Positioning System and sensors. The results prove that the system is easily implementable in real time.

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