Vehicle Theft Detection Using GPS And GSM

D S Bhavani[1], P Meghana Reddy[2]
[1]Assistant Professor, Dept of Computer Science and Engineering
[2] Dept of Computer Science and Engineering
[1, 2] Mahatma Gandhi Institute of Technology Hyderabad, Telangana, India – 500075

Abstract- *The vehicle theft detection is mainly based on vehicle tracking system which is an electronic device installed in a vehicle to enable the owner or a user to track the vehicle's location. Our project is a vehicle tracking system that works using GPS and GSM technology, which would be the cheapest source of tracing a vehicle and it would work as anti-theft system. It is 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). This design will continuously monitor a moving vehicle and report the status of vehicle on demand. For doing so, on a microcontroller is interfaced serially to a GSM modem and GPS receiver. A GSM modem is used to send the position (latitude and longitude) of the vehicle from a remote place. The GPS modem will give data continuously indicating the position of the vehicle. The same data is sent to the mobile at the other end from where the position of the vehicle is demanded. It is designed in such a way that the system automatically sends a message to the mobile indicating the position of vehicle in terms of latitude and longitude in real time.*

Keywords- Vehicle tracking system, GPS, GSM, Anti-theft, Microcontroller.

I. INTRODUCTION

Security, especially theft security of vehicle in common parking places has become a matter of concern. An efficient automotive security system is implemented for anti-theft using an embedded system integrated with Global Positioning System (GPS) and Global System for Mobile Communication (GSM). This proposed work is an attempt to design and develop a smart anti-theft system that uses GPS and GSM system to prevent theft and to determine the exact location of vehicle.

Vehicle tracking system's main aim is to provide security to vehicles. The technologies like GPS and GSM are included in the design. This system enables the owner to observe and track his vehicle and find out vehicle movement and its past activities.

This technology plays a vital role in the world of security of 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 the vehicle. Thus, it is used as convert unit which continuously or by an interruption sends the location in a message format to the owner.

A prototype of active system that transmits vehicle's data in real time via cellular or satellite networks is developed. Real time tracking system can transmit the collected information about a vehicle after regular intervals. It is mainly beneficial for the companies which are based on transport system. Since it can show the position of all vehicles in real time, one can keep track of their goods during transportation. Many vehicle systems that are in use now a days are some of Automatic Vehicle Location. The location is determined using GPS and after capture, the tracking data is transmitted using a wireless communication system. GSM is the most common used service for this purpose.

In this project an Arduino is used for interfacing to various hardware peripherals. The current design is an embedded application, which will continuously monitor a moving vehicle and report the status of vehicle on demand. For doing so an Arduino is interfaced serially to a GSM Modem and GPS receiver.

A. Existing System:

A variety of devices and methods have been developed for the tracking of the vehicles that have been theft. Some of them are:

   i.   *Raspberry pi-based tracking system*:

This system has a device to track the location of the vehicle but the main micro controller that is used is Raspberry pi. It is costly and if any fluctuations occur there is a chance of damage to the entire system. It is sometimes dangerous to use that device.

   ii.   *Vehicle Theft Detection based on Nordioc radio frequency*:

This is the system that is used officially by the police department to track the vehicles. Red tags are used here. But this method can be only used by the officials and common people cannot have access to it.

B. *Proposed System:*

Vehicle tracking system is the technology used to determine the exact location of any vehicle using different methods like GPS and other navigation systems operating through satellites.

This device is used to intimate the position to the concerned vehicle through an SMS to a registered mobile number.So, by this device we get the exact location of the vehicle in the form of the latitudes and longitudes to the mobile.

II. LITERATURE SURVEY

A GPS and GSM based vehicle tracking system is proposed by Ni Ni San Hlaing, Ma Naing, San San Naing [1] uses the satellite technology for tracking the vehicles.GPS and GSM Modules are used for the tracking of vehicle. The device may face any obstacles if there are high penetrated walls as the signals may not be received properly.

An IOT based vehicle tracking system is developed by M. Poushya, K. Rupasri, N. Supritha, K. Hema[2] uses the raspberry pi as the main micro controller. GPS module is used to locate the vehicle along with the help of raspberry pi. The location is not accurate and there is lack of gsm module and the device is costly. This system has a device to track the location of the vehicle but the main micro controller that is used is Raspberry pi. It is costly and if any fluctuations occur there is a chance of damage to the entire system. It is sometimes dangerous to use that device.

A vehicle Theft detection based on nordioc frequency is designed by Nagadevi S, Anil kumar N, Kumar Raja J[3] uses nordioc radio frequency to detect the vehicles. RFID tags are used to locate the vehicle. This device cannot work for all vehicles. This is an extremely critical process as radio frequencies are used to locate the vehicles.

Real time vehicle theft identity and control system system based on arm9 is developed by D. Narender Singh,Tejaswini[4]. A face recognition system is used to know the owner and notify if another person is using the vehicle. This device cannot used if we want to track the vehicle as there are no gps and gsm modules.

An IOT based vehicle theft detection and remote engine locking system is developed by Madhu M Nayak, Spandana M Suresh, Tejaswini, Vaishnavi V, Yashaswini S[5] locks the engine if another person is using the vehicle. A biometric based sensing system is used to identify the vehicle. There are many cases where such a system fails.

III. DESIGN AND METHODOLOGY

A System Architecture is the conceptual model that defines the structure and views of the system. A system Architecture consists of system components and the sub systems developed that will work together to implement overall system. In this project the principal components are Arduino Uno, GSM Modem, GPS Module, Power supply (can be either system or battery), adapter.
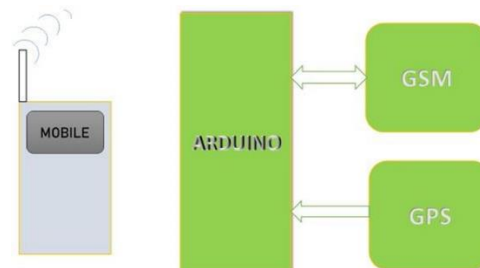

Fig.1 System Architecture

This device is used to intimate the position to the concerned vehicle through an SMS to a registered mobile number, so by this device we get the exact location of the vehicle in the form of the latitudes and longitudes to the mobile.

Vehicle tracking system's main aim is to provide security to vehicles. The technologies like GPS and GSM are included in the design. This system enables the owner to observe and track his vehicle and find out vehicle movement and its past activities.

In this project an Arduino is used for interfacing to various hardware peripherals. The current design is an embedded application, which will continuously monitor a moving vehicle and report the status of vehicle on demand. For doing so an Arduino is interfaced serially to a GSM Modem and GPS receiver.

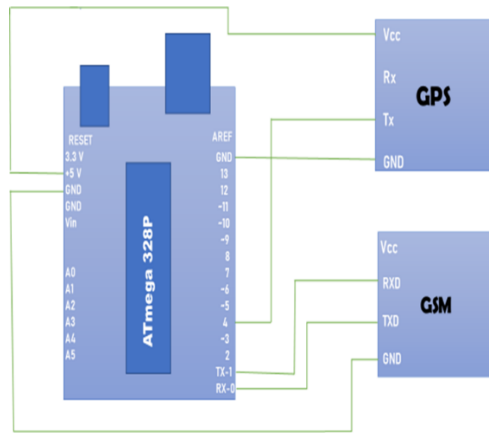This device is the integration of the software and the hardware. Both work to make the device success.

Fig.2 Circuit Diagram

The circuit connections are made according to the above diagram. The GPS and GSM are connected to the Arduino uno with the help of connecting probes. The Arduino is given power supply with the help of battery.

Working of GPS Module:

GPS Receiver is used for detecting coordinates of the vehicle location AND GSM module is used for sending the coordinates to user by SMS. A system is designed in such a way that user will receive message for every 20 seconds.

This system is installed in a vehicle and is provided with a power supply.The system will read the message and acquires the GPS location instantaneously. Arduino reads coordinates from gps module data and send it to user using gsm module.This message contains the coordinates All GPS (which stands for Global Positioning System) units work in the same basic way. The GPS network is made up of 24 satellites that orbit the earth in precise, predefined trajectories while broadcasting radio signals that contain data about the satellite's precise location. Each satellite's orbit and accompanying radio signal is unique.

GPS receivers are configured to:

1. Accept the incoming signals from the various satellites.
2. Compare the location data and its transmission time.
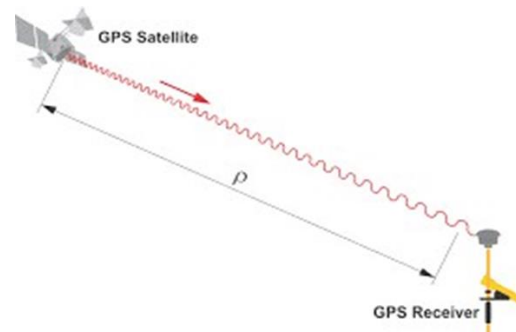3. Use this information to triangulate the receiver's precise location.

Fig. 3 Working of GPS

The GPS device needs at least three signals to determine its position in two-dimensional space and at least four signals to determine its location in three-dimensional space. Depending on location, time of day, and the presence or absence of structures that may block the signal, we can expect a receiver to track as many as eight satellites at any given momentof the vehicle location and these coordinates are located using google maps and trace the vehicle. Based on your location data, GPS receivers can determine time and distance to another location, your bearing, even your speed/rate of travel (by comparing real-time changes in location and the time to move from one to the next). This is all just with a single GPS unit operating alone.

The GPS device needs at least three signals to determine its position in two-dimensional space and at least four signals to determine its location in three-dimensional space. Depending on location, time of day, and the presence or absence of structures that may block the signal, we can expect a receiver to track as many as eight satellites at any given momentof the vehicle location and these coordinates are located using google maps and trace the vehicle. Based on your location data, GPS receivers can determine time and distance to another location, your bearing, even your speed/rate of travel (by comparing real-time changes in location and the time to move from one to the next). This is all just with a single GPS unit operating alone.

List of modules:

1.Arduino Uno
2.GSM Module(sim 800a)
3.GPS Modem(neo 6m)
4. Adapter

A.   Arduino Uno

Arduino uno is an open-source microcontroller board based on the microchip Atmega328P microcontroller. The board is equipped with sets of digital and analog input/output pinsthat may be interfaced to various expansion boards and

other circuits. The board has 14 digital pins, 6 analog I/O pins, and is programmable with Arduino IDE(Integrated Development Environment), via a type B USB cable. It can be powered by theUSBcable or by an external 9- voltbattery, thoughitacceptsvoltagesbetween7and20volts. It is also like the Arduino Nano.

Fig.4 Arduino Uno

B. GSM Module:

GSM (Global system for mobile communication) is a standard developed by the European Telecommunication standards institute (ETSI). GSM module or a GPRS module is a chip, or a circuit used to establish communication between a mobile device or a computing machine and a GSM system. It was created to describe the protocols for second generation (2G) digital cellular networks used by mobile phones and is now the default global standard for mobile communications. These modules consist of a GSM module or GPRS modem powered by a power supply circuit and communication interfaces (like RS-232, USB 2.0 and others) for computer. A GSM modem can be a dedicated modem device with a serial, USB or Bluetooth connections, or it can be a mobile phone that provides GSM capabilities.

The GSM module demonstrates the use of AT commands. AT commands are instructions used to control a modem. AT is the abbreviation of attention. GSM modems and mobile phone support an AT command set that is specific to the GSM technology, which includes SMS – related commands like AT+CMGS, AT+CMSS, AT+CMGL, AT+CMGR etc. We have used SIM800A model that works on frequencies 850 MHz GSM, 900MHz EGSM, 1800 MHz DCS and 1900MHz PCS. It has one UART port.

Fig.5 GSM Module

C. GPS Modem

Global Positioning System (GPS) is a satellite-based system that uses satellites and ground stations to measure and compute its position on Earth. GPS is also known as Navigation System with Time and Ranging (NAVSTAR) GPS. GPS receiver needs to receive data from at least 4 satellites for accuracy purpose. GPS receiver does not transmit any information to the satellites. This GPS receiver is used in many applications like smartphones, cabs, fleet management etc.

GPS receiver uses a constellation of satellites and ground stations to calculate accurate location wherever it is located. These GPS satellites transmit information signal over radio frequency to receiver. With the help of this received information, a ground station or GPS module can compute its position and time.

GPS receiver module give soutputin standard (National Marine electronics Association) NMEA string format. It provides output serially on Tx pin with default 9600 baud rate. This NMEA string output from GPS receiver contains different parameters separated by commas like longitude, latitude, altitude, time etc. Each string starts with '$' and ends with carriage return / line feed sequence.

Fig.6 GPS Modem

D. ADAPTAR

An adaptor is a device that converts attributes of one device or system to those of an otherwise incompatible device or system. Some modify power or signal attributes, while others merely adapt the physical form of one connector to another. Adaptor is a special device for connecting electrical equipment to a power supply.

IV. RESULTS

Testing of this project is done when the Arduino code is compiled and uploaded to the Arduino using USB cable. The below Fig.7 shows how the components are connected.
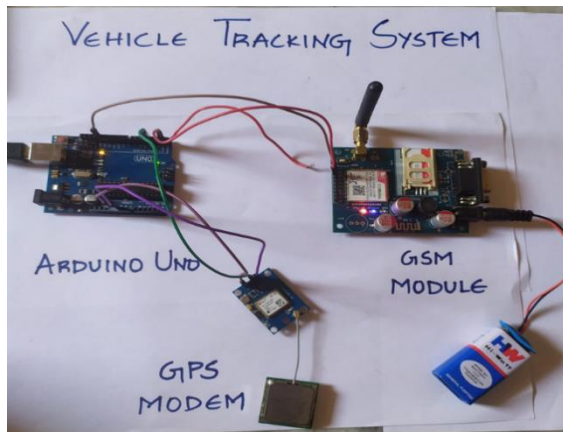
Fig.7 Arduino with GSM Module and GPS Modem

The system gets initiated whenever the gsm module and the Arduino have power supply which is done through a 5V battery supply. Firstly, the code is run on the Arduino IDE platform and after the successful execution of the code, it is dumped into the Arduino. As all the components are connected, after dumping the code into the Arduino and supplying power the system starts working and the system may look like the below Fig.8
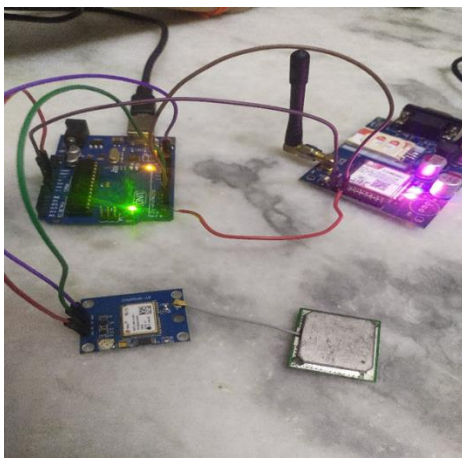

Fig.8 Working Module

The below Fig.9 shows that the code is run on the Arduino IDE and verified first. After verification and if the code is without any errors and bugs the code is dumped into the Arduino uno hardware component where all the various components are connected.
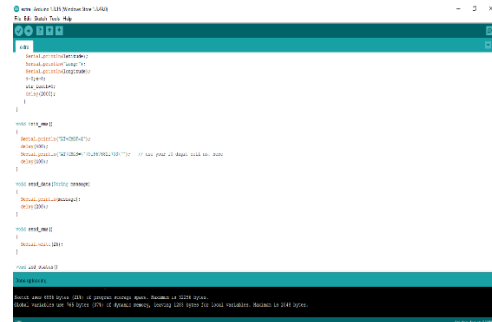

Fig.9 Code on Arduino IDE platform

After dumping the code into the Arduino uno and connecting all the components and supplying the power we can check the various locations where our system is on the serial monitor that we acquire with the help of GSM and GPS. The below Fig.10 shows the serial monitor screen.
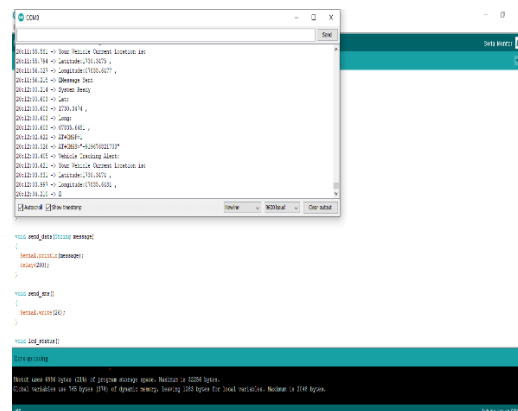

Fig.10 Serial Monitor

Simultaneously, the same information is sent to the registered mobile number. The location is sent in the form of latitudes and longitudes to the mobile of the number. There is a provision of changing the owner's mobile number. After receiving the latitudes and longitudes we can search for the location on the google maps. The owner will be receiving the alert for every 30 sec. This alert duration also can be modified in the code. Whenever the owner is notified. The below Fig.11 shows the alert message with the location sent to the owner and the Fig.12 shows the exact location found with the latitudes and longitudes sent to the owner.
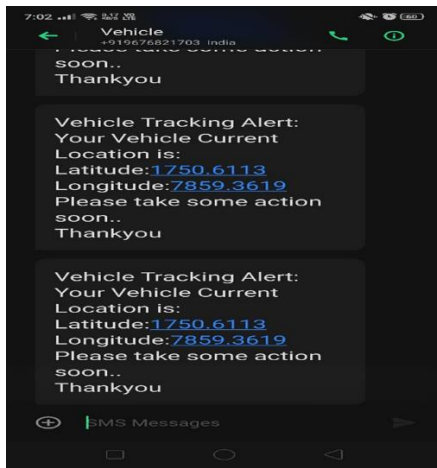
Fig.11 Alert message sent to owner's mobile.

After receiving the alert message, user can now check for the location in google maps to find the exact location. The below fig 4.6shows the location where the system is installed.
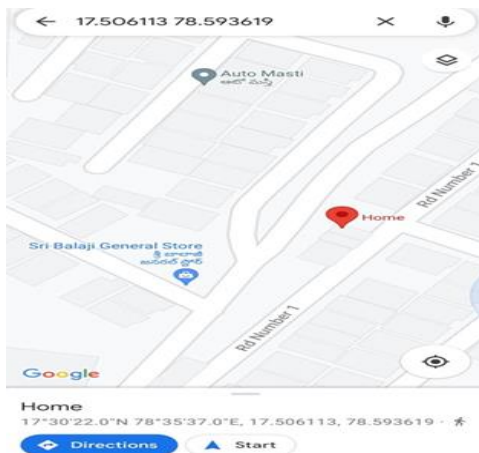

Fig.12 Exact location of the system

V. CONCLUSION

The main objective of "Vehicle Tracking System" is to find the exact location of the lost vehicle. This is very much useful for the heavy load vehicles such as lorries and trucks because they do not have a gps tracking system involved. In such cases, if the vehicle is lost the owners need to go to the police station and file a complaint to find the vehicle. This process is time consuming. So instead, if we install this system the owner can be notified with the location of their lost vehicle. This is a time saving process. This can be used for any type of vehicles.

VI. FUTURE WORKS

The work can be updated by integrating the google maps with the gps system, if so, the user will be sent the exact location. Apart from that we can also develop a owner recognition system which will alert if the person other than the owner is using the vehicle at the initial stage so that the owner can become alert.

REFERENCES

[1] "*GPS and GSM based vehicle tracking system*"by Ni Ni San Hlaing, Ma Naing, San SanNaing, 2019.

[2] *"IOT based vehicle tracking system*" by M. Poushya, K. Rupasri, N. Supritha,K. Hema, 2019.

[3] "Vehicle *Theft detection based on nordioc radio frequency*" by Nagadevi S, Anil Kumar N, Kumar Raja J,2018.

[4] "Real *time vehicle theft identity and control system based on arm9*" by D.Narender Singh, S.Tejaswi, 2018.

[5] "*An IOT based Vehicle theft detection and remote engine locking system*" by Madhu M Nayak, Spandana M Suresh, Tejaswini, Vaishnavi V, Yashaswini S, 2017.

[6] "Vehicle *Theft Detection Using Face Recognition*" by Prof. P.R. Shahane1,Subhashi Gupta2, Rajat Shrivastav3, Vignesh.S4, Sushant Singh5, 2019.

[7] Nagaraja, B.G.; Rayappa, R.; Mahesh, M.; Patil, C.M. and more authors, "*Design & Development of a GSM Based Vehicle Theft Control System*", 2016.

[8] R.Ramani, S.Valarmathy, Dr. N.SuthanthiraVanitha, S Selvaraju, R Thangam, M Thiruppathi, "*Vehicle tracking and locking system based on GSM and GPS*", 2014.

[9] Champa Bhagavathi.R, Gowri.B.R, Kasturi.R, Pooja.C,"*Vehicle Theft Detection and Prevention Using GSM and GPS*", International Journal of Innovative Research in Computer and Communication Engineering, 2015.

[10] K.Kanimozhi, D.Mukesh, M.Ashok, "*An IOT Based Approach for Vehicle theft detection*", Global Research and Development Journal for Engineering, National Conference on Computational Intelligence Systems, 2013.