Implementation of Car Tracking System using GSM/GPS

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Abstract- A vehicle tracking system is an electronic device installed on a vehicle so as that it'd be track by its owner or a third-party for its position. Most of today's vehicle tracking system uses Global Positioning System (GPS) to urge an accurate reading of the vehicle position. Communication components like cellular phone (GSM) and GPS will be employing to transmit the vehicle's position to remote user. Vehicle's location and mobilization status information are often viewed by employing a software application on a computer system or on a cell phone. Vehicle tracking systems are commonly employed by fleet operators for fleet management functions like routing, dispatch, on-board information and security. Other applications include monitoring driving behavior, such as an employer of an employee, or a parent with a teenager driver.

Index Terms- car security system, GMS/GPS Module, Tracker, vehicle.

I. INTRODUCTION

In city life, transportation is common and of great importance to facilitate movement. A lot of security bridge do occur on the road every day. Therefore, the need to secure and monitor our vehicles arises. To secure and monitor vehicles remotely, a system using GPS and GSM technologies with google map will be developed in this research work. Various problems that necessitate this research work are:
1. In a situation when vehicle is stolen/hijack one is confused what to do
2. If one has something expensive and he wants to check it regularly
3. To locate the shortest path to the vehicle

All these problems will be overcome in this research work. This device has Global Positioning System (GPS) which will get the coordinates from the satellites among other basic data. tracking device has a significant in current world. This can be helpful in military monitoring, as anti-theft in cars and many other different applications. The device is microcontroller based that comprises of a global positioning system (GPS) and global system for mobile communication (GSM). This research utilizes just a single GPS gadget and a two way correspondence process is accomplished utilizing a GSM modem. GSM modem, furnished with a SIM card utilizes a similar correspondence process as we are utilizing in customary telephone.

This device is easy to use, effectively installable, effectively open and can be utilized for different purposes. After installation the device can locate object no matter the location or weather condition. Google map is use to view the location of the target anytime and anywhere in any weather conditions.

A. Objective of this Project

The main aim of the project is to design and develop a vehicle mobilizer and demobilize system within the real time environment. The user can send a command from his cellphone to the GSM module and gets the module check for the user's authentication and if found to be valid, it'll immediately send the details of the locations just like the latitude and therefore the longitude using GPS module. So the user can get to know the exact location of vehicle pointed out on the google maps. A user can as well send a command to demobilized or mobilized the vehicle.

B. Scope of the Study

The scope of this research is to study and design the GPS/GSM Vehicle Tracking system that can give an output of the information such as time, position, and speed from the GPS receiver. The users will also be able to send command to the GPS receiver using the GSM technology.

C. Vehicle Tracking System

A car tracking device installed in a vehicle or fleet of vehicles with computer design software at one operational base to enable car owner or third party to track vehicle's location by collecting the coordinate data from the field and send it the base operation, Nowadays, trackers generally use GPS or GLONASS innovation for finding the vehicle, yet different sorts of programmed vehicle area innovation can likewise be utilized. Vehicle information can be seen on electronic maps through the Internet or specific programming.

Vehicle tracking devices are also installed as a vehicle prevention and recovery systems from theft. Police can basically trace the vehicle via map application to locate a stolen vehicle. This device serves as either an additional or replacement for a traditional Car alarm. This tracking device make it possible to remotely control vehicle's lock and engine if there should arise

emergency that will warrant that. Vehicle tracking device can be used to reduce the insurance policy cost.

Fig.1.0: Tracking system overview

1. Anti-Hijack and Vehicle Security System

Both purchaser and vehicles used for mass transportation can be furnished with GPS Tracking framework. A vehicle that is equipped with tracking system is easier for the police to recoup when stolen by following its movement. Some tracking enable automatic car lock and oil/fuel cutoff in an emergency situation. They may likewise trigger a robotized email or message to a telephone if caution is set off or the vehicle is moved without the approval.

2. Tracking your Possessions and Near Ones

GPS Tracking System helps you to keep a track of your car, luggage, valuable possessions, pets and even loved ones. They can be located easily keeping you free of stress and worries. GPS Tracker can also help you in locating where your child is going late at night

3. Adventure / Traveling

GPS Locator or tracker helps the hikers or campers to find their home base.
The home base or starting point can be stored in the GPS Tracker and it will lead you back to the same place in case you lose the way.
Finding people who are lost on nature trails or avalanches can also be done through GPS Tracking Systems

II. IMPLEMENTATION METHODOLOGY

The method of implementation of the research work will be done by segmenting the circuit into bit or unit and a study on how the various unit works like the study on how GPS works will be conduct to understand its operation and command set (NMEA) that will be used. The PIC Microcontroller is also an important device to understand as it is to control the operation of the GPS receiver. The microcontroller will be program using C language.
The second part will be the GPS-Microcontroller and the GSM integration. The study on GSM technology will be conduct in this phase. It is important in order to transmit the data from the GPS receiver to the computer using the GSM technology. The correct GSM command set will be essential to make sure the data is on the right path and transmitted correctly.

Below are the following units of the design:
- The Power supply unit
- The GSM/GPS Module unit
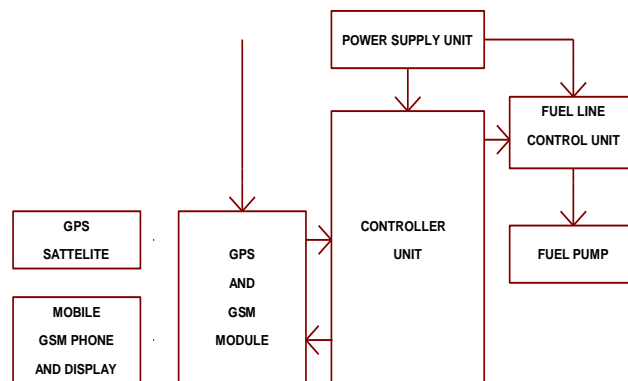- The Controller unit
- The Fuel Line Control Unit

Fig. 2. Block schematic for vehicle tracking system.

A. The Power Supply Unit

The power supply unit comprises of a 12 volts battery (vehicle battery) and a voltage regulator IC (IC_1) which is used to regulate the 12V to 5volts power supplied to the GSM/GPS module, Microcontroller and the fuel line control unit.
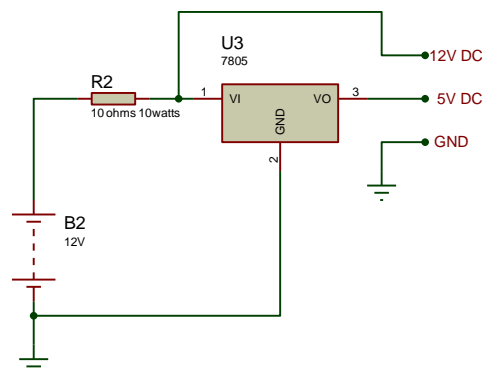

Fig. 3: The Power Supply Unit to the Circuit

B. The Fuel Line Control Unit

This unit is the interface between the controller unit and the FUEL PUMP. It enables the microcontroller to effectively control the operation of the Fuel Pump, i.e. enabling the controller to ON and OFF the Fuel Pump. it was implemented with the following components:
- Relay (12V 30A DC).
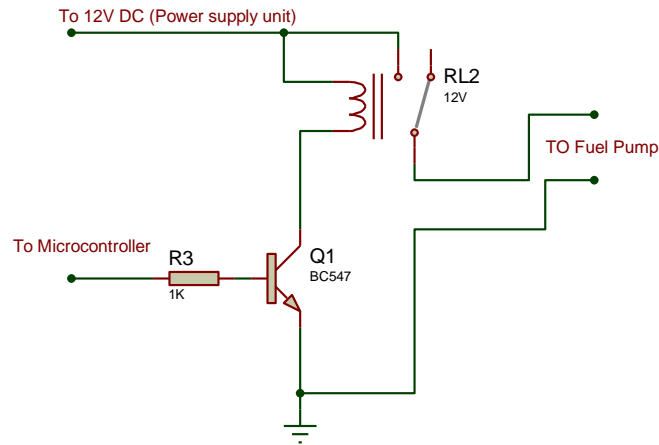- 1K Resistor.
- NPN transistor (BC547).

Fig. 4: The Fuel Line Control Circuit

C. The GSM/GPS Module Unit

This unit enables the system to receive SMS commands from the users and also lets the system obtain the latitude and longitude coordinates needed to locate the vehicle.

The SIM900A GSM/GPS Module from SIMCOMM Group was selected. Below are the features of the module.

- The Power requirement is 5V DC, 0.5mA
- It can send/receive SMS
- It can fix the GPS Satellite in seconds
- It uses AT Command SET. Very compatible for communications with controllers.
- It is readily available and cost effective.

The module is connected directly to the microcontroller unit. Below is the circuit interface between the controller and the GSM/GPS Module.
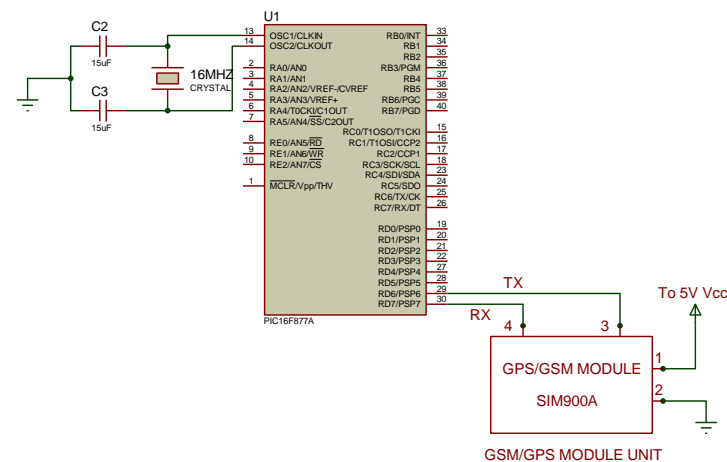

Fig 5: Circuit Interface between the Microcontroller and the GSM/GPS Module

At Commands Used By The Controller And The GPS/GSM Module

Send("\r\nAT+IPR=9600"); send("\r\n");
// used to set baud rate
Send("\r\nAT+CREG=2"); send("\r\n");
// used to register network
Send("\r\nAT+CGPSPWR=1"); send("\r\n");

// used to power ON the GPS
Send("\r\nAT+CMGS="); // used to send SMS
Send("\r\nAT+CMGR=");// used to Read SMS
Send("\r\nAT+CGPSINF?"); send("\r\n");
// used to get Lat. and Long. Coordinates.
See Appendix A, for complete code

Below is a brief flow of the execution of the microcontroller

- Wait for SMS based command from the user.
- if command received is "LOCK", OFF Fuel Pump
- if command received is "UNLOCK", ON Fuel Pump
- if command received is "MAP", get latitude and longitude coordinates from GSM/GPS Module, parse it into Google map URL/Link, send back to the user.
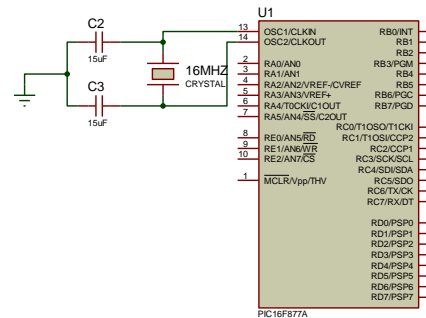

Fig 6: Circuit of the Microcontroller and the Crystal oscillator

D. Software Design

The software design is divided into three stages. These are algorithm Generation, flow chat representation and coding.

1. Algorithm Generation

An algorithm is a statement of the procedure adopted in solving a problem.
The sequence of the system operation is stated below,

1. Initialize the system on start.
2. Wait for SMS Command from the User.
3. Read command into working memory.
4. Compare the received command with the SET standard commands.
5. If UNLOCK, activate the fuel pump. If LOCK, deactivate the fuel pump. If MAP, get location coordinates, parse Google map link and send to user.
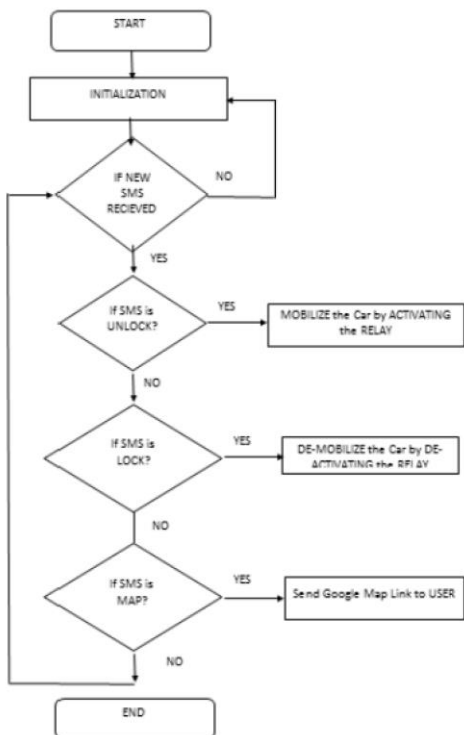6. End process.

2. Flow Chart

Fig. 7: flow chart

3. Coding

The coding is done in MPLAB C-Language language. The code Contains the instruction of program that runs in the microcontrollers.
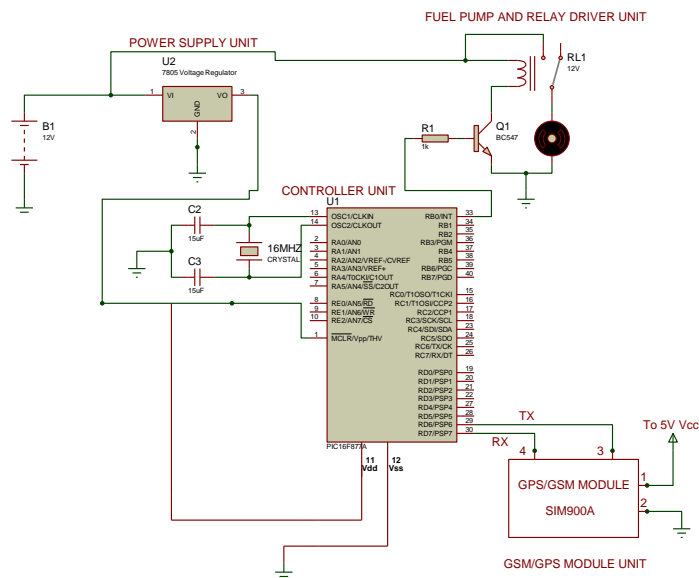
4. Circuit Diagram

Fig. 8: Operational Circuit Diagram

Circuit Operation

The circuit is powered from the car 12V DC battery. The 12V is regulated to 5V by a fixed voltage regulator LM7805 which is required by the circuit to power the PIC16F877A microcontroller and SIM908.

When the switch is ON the circuit is initialized within two minutes and this is indicated by the LED. The initialization process is completed once the LED goes OFF showing the circuit is set. Once an SMS message is received, i.e. MAP, LOCK or UNLOCK can be sent by the owner's phone or any other cell phone that knows the SIM number of the GSM/GPS module to the module. If an SMS "LOCK" is sent to the microcontroller through the GSM module, the microcontroller will send a 5V signal to turn ON BC547 transistor which drives the DC relay to activate and also to cut off the fuel pump line.

Once the car has been LOCK, to UNLOCK the car, an SMS "UNLOCK" is sent which drives the transistor to cutoff state thereby deactivating the relays and the fuel pump line restored. A command, MAP causes the microcontroller to get longitude and latitude coordinates, parse it into Google map link, then sends to the user.

III. RESULT

During the testing it was confirmed that when a user send a text message 'map' the system respond by sending the location of the vehicle and also 'lock' and 'unlock' cut and restore the fuel line respectively. The location information contains the longitude and latitude of the spot the car is at the time of request.

ACKNOWLEDGMENT

CONCLUSION

The research journal is all about tracking the location and controlling of a vehicle. The system is about making vehicle more secure by the use of GPS, GSM technology and a Google map web application. With this system user, can easily know the location and have control over the vehicle when it's hijack. The system was implemented following the methodology and was achieved.

REFERENCES

[1] Pankaj Verma and J.S Bhatia (2013), Design and development of gps-gsm based tracking system with google map based monitoring

[2] Hlaing, Ni & Naing, Ma & Naing, San. (2019). GPS and GSM Based Vehicle Tracking System. International Journal of Trend in Scientific Research and Development. Volume-3. 271-275. 10.31142/ijtsrd23718.

[3] Maurya, Kunal & Singh, Mandeep & Jain, Neelu. (2012). Real Time Vehicle Tracking System using GSM and GPS Technology-An Anti-theft Tracking System. International Journal of Electronics and Computer Science Engineering. 1.

[4] https://amedleyofpotpourri.blogspot.com/2019/11/global-positioning-system.html

[5] https://www.trackometer.net/news/applications-of-vehicle-tracking-system/

[6] https://itlaw.wikia.org/wiki/Vehicle_tracking_system

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