Vehicle tracking GPS system using GSM sim

Minor Project 1

Submitted by:

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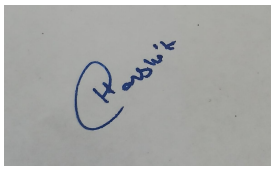
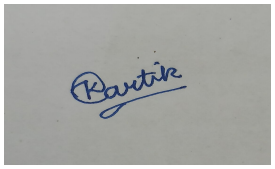
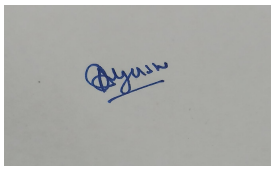
ACKNOWLEDGEMENT

We would like to place on record my deep sense of gratitude to Dr. Shardha Porwal, Designation, Jaypee Institute of Information Technology, India for her generous guidance, help and useful suggestions.

Name of Students (Enrollment)	**Signature(s) of Students**
Harshit Chopra(20104013)	
Kartik Gupta (20104025)	
Ayush Sharma(20104059)	

DECLARATION

We hereby declare that this submission is our own work and that, to the best of our knowledge and beliefs, it contains no material previously published or written by another person nor material which has been accepted for the award of any other degree or diploma from a university or other institute of higher learning, except where due acknowledgment has been made in the text.

Place: Jaypee Institute of Information Technology, Sector 62, Noida, Uttar Pradesh

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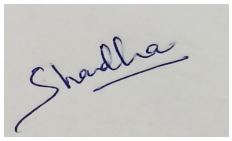
CERTIFICATE

This is to certify that the work titled "Vehicle tracking GPS system using GSM sim" submitted by Harshit Chopra, Kartik Gupta, and Ayush Sharma of B.Tech of Jaypee Institute of Information Technology, Noida has been carried out under my supervision. This work has not been submitted partially or wholly to any other University or Institute for the award of any other degree or diploma.

Digital Signature of Supervisor : 

Name of Supervisor : Dr Shardha Porwal

Designation : Asst. Prof. (Sr. Grade)

Date : 24.11.22

ABSTRACT

Real-time tracking system on valuable items and assets has the potential to resolve a number of global issues. The Global Positioning System, or GPS, offers position in any situation utilizing both offline and online methods. There are several different kinds of GPS tracking systems on the market. When a device has GPS turned on, GPS satellites send out signals, which GPS receivers then utilize to calculate the latitude, longitude, and altitude as well as the time. In the contemporary world, GPS has shown to be one of the greatest tracking technologies. When it comes to security, it has shown to be a useful tool.

Any device with a sim card can utilize the GPS tracker gadget, an offline GPS system. An encryption method is used to encrypt the location. With the help of this technology, a user can locate the target people and see their whereabouts on a map of the web application. By using concepts from business intelligence and predictive analytics to improve the efficiency of vehicle tracking systems. Generally speaking, tracking is a technique in which we keep tabs on a location using latitude and longitude (GPS coordinates).

1. Track the users' locations is one of the study's goals.

2. Monitor a vehicle's whereabouts.

3. Improve the efficiency and performance of fleet business owners.

The majority of commercially available vehicle tracking technologies are prohibitively expensive. So, we made the decision to create a simple, affordable tracking system on our own. Users have the option to demand a location. The site is safe and encrypted. The client side performs the decryption.

TABLE OF CONTENTS

ABBREVIATIONS AND NOMENCLATURE

GPS: Global Positioning System

GSM: Global System for Mobile communication

IDE: Integrated development environment

INTRODUCTION

When a device has GPS turned on, GPS satellites send out signals, which GPS receivers then use to calculate the latitude, longitude, and altitude as well as the time. There are many different location-tracking tools available, including GPS watches, GPS devices, and mobile phones. It retrieves the device's location information with the aid of middleware services, uploads it to a cloud database, and then automatically updates the location at predetermined intervals.

Any device with a sim card can use the GPS tracker device, an offline GPS system. An encryption algorithm is used to encrypt the location. With the help of this system, a user can locate the target users and see their locations on a map of the web application. By using concepts from business intelligence and predictive analytics to improve the efficiency of vehicle tracking systems. Generally speaking, tracking is a process in which we keep tabs on a location using latitude and longitude (GPS coordinates).

The majority of commercially available vehicle tracking systems are too expensive. So, we made the decision to create a simple, affordable tracking system on our own. Users have the option to demand a location. The location is encrypted and secure. The client side performs the decryption.

BACKGROUND STUDY

Many researchers have been interested in the real-time management and tracking of cars, and a lot of study has been done on tracking systems. Numerous anti-theft devices, including steering wheel locks, network tracking systems, and conventional electronic alarms, have been recently developed.

A tracking system employing a GPS, GSM modem, and a microcontroller is represented by the work of Pradip V. Mistary and R. H. Chile. The task is carried out to keep track of any equipped vehicle's movement at all times. In this system, a GPS receiver collects location information and continually translates it into a data string in the NMEA 0183 format. The receiver at the operator station gets this reading and inputs it into the GUI programme created in MATLAB. The application includes an algorithm that, when called, obtains the NMEA reading and converts it into a degree format appropriate for Google Earth.

The work done by Stephen Teang Soo Thong, Chua Tien Han and Tharek Abdul Rahman proposed front-end intelligent and web-based FMS to manage vehicle fleet efficiently and effectively.

The Global Positioning System (GPS) in this system will obtain the coordinates from the satellites as well as other vital data. In the current world, tracking systems are crucial. This has a number of uses, including military monitoring and vehicle theft tracking. The system uses a microcontroller and includes a worldwide system for mobile communication (GSM) and a GPS (GSM).

This system is simple to use, simple to install, simple to access, and useful for a number of other things. After installation, the system will use a Web application in Google Maps to find the target. The device enables tracking of the target at any time, anywhere, and in any weather.

REQUIREMENT ANALYSIS

Any device with a sim card can utilize the GPS tracker gadget, an offline GPS system. An encryption method is used to encrypt the location. With the help of this technology, a user can locate the target people and see their whereabouts on a map of the web application. By using concepts from business intelligence and predictive analytics to improve the efficiency of vehicle tracking systems. Generally speaking, tracking is a technique in which we keep tabs on a location using latitude and longitude (GPS coordinates)..

The majority of commercially available vehicle tracking technologies are prohibitively expensive. So, we made the decision to create a simple, affordable tracking system on our own. Users have the option to demand a location. The site is safe and encrypted. The client side performs the decryption.

GPS in our today's modern world has proved to be one of the best tracking device.It has proved to be a fruitful device in terms of security.

COMPONENTS

- Arduino UNO
- SIM800L GSM/GPRS Module
- GPS Module
- LM2596S DC-DC Buck Converter Power Supply
- Connecting Wires
- Arduino IDE
- Android Studio

DETAILED DESIGN

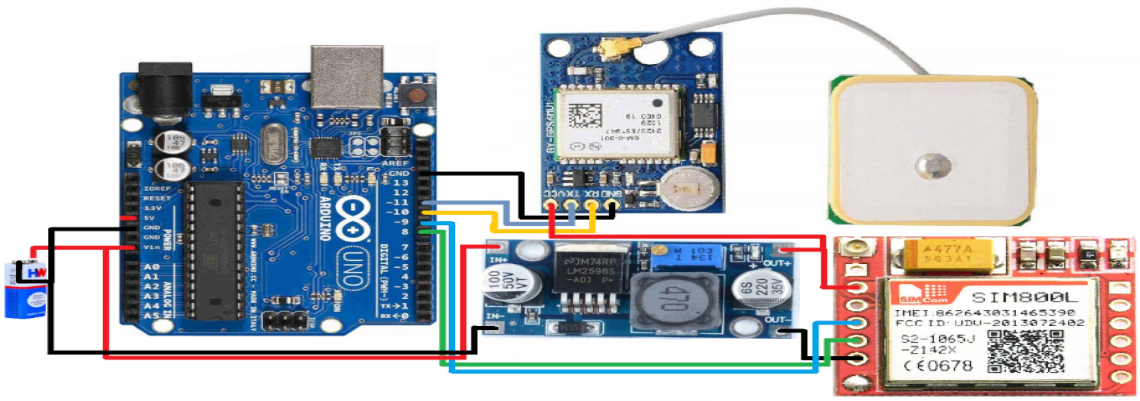


Fig. 1 (Circuit Design)

Arduino UNO: a module-connected programmable open-source microcontroller board.

SIM800L GSM/GPRS: An extremely small GSM modem that can convey the position via SMS is theModule. The operational voltage of the chip is between 3.4V and 4.4V.

GPS Module: The NEO-6M GPS module has the highest level of tracking sensitivity in the industry and can track 22 satellites across 50 channels. The latitude and longitude are sent through SMS.

LM2596S DC-DC Buck Converter Power Supply: The high-precision potentiometer converter step-down the voltage.

Jumper wire: Tie together distant electric circuits used to make printed circuit boards.

9-volt battery: Power source

Arduino IDE: A text editor for writing code, a message area, a text console, a toolbar with buttons for commonly used operations, and a number of menus are all included in the Arduino Integrated Development Environment (IDE). In order to upload programmes and communicate with them, it connects to the hardware.

Android Studio: To create a decryption application used in mobile devices.

IMPLEMENTATION

1. First we have made a hardware system using a few modules and a microcontroller which can send the location to the desired device.
2. To fetch the location we used the GPS module which can give longitude and latitude details to the microcontroller.
3. Microcontroller sends the longitude and latitude information to the desired device using the GSM Module via the 2G network through the sim card installed in the GSM Module.
4. The device receives the location information in the SMS form .
5. To send the location information link directly in the SMS app of the device can be read or misused by another one easily.
6. For that reason we have sent the encrypted information to the device in the form of SMS and the encryption is done on the side of the Arduino

Source Code of Arduino :

```
#include <SoftwareSerial.h>

SoftwareSerial sim800l(10, 11);

#include <SoftwareSerial.h>

#include <TinyGPS.h>

SoftwareSerial mySerial(7, 8);

TinyGPS gps;

void gpsdump(TinyGPS &gps);

void printFloat(double f, int digits = 2);

void setup()

{

sim800l.begin(9600);

mySerial.begin(9600);
```

```
Serial.begin(9600);

delay(1000);

}

void loop()

{

  Serial.write("started");

  Serial.write('\n');

bool newdata = false;

unsigned long start = millis();

// Every 5 seconds we print an update

while (millis() - start < 5000)

{

if (mySerial.available())

{

char c = mySerial.read();

//Serial.print(c); // uncomment to see raw GPS data

if (gps.encode(c))

{

newdata = true;

break; // uncomment to print new data immediately!

}

}

}
```

```
if (newdata)
{
gpsdump(gps);
Serial.println();
}
}
void gpsdump(TinyGPS &gps)
{
long lat, lon;
float flat, flon;
unsigned long age;
gps.f_get_position(&flat, &flon, &age);
Serial.println("Sending SMS...");

sim800l.print("AT+CMGF=1\r");
delay(100);
sim800l.print("AT+CMGS=\"+919643219179\"\r");//EX +919876543210

char ch[18];
dtostrf(flat, 2, 6, ch);
ch[9]=',';
  dtostrf(flon, 2, 6, &ch[10]);
```

```
  for(int i = 0; (i < 100 && ch[i] != '\0'); i++)
      ch[i] = ch[i] + 3;

Serial.println(ch);

sim800l.print(ch);
sim800l.print((char)26);
delay(500);
sim800l.println();
Serial.println("Text Sent.");
delay(5000);
}
void printFloat(double number, int digits)
{
// Handle negative numbers
if (number < 0.00)
{
Serial.print('-');
number = -number;
}
// Round correctly so that print(1.9990, 2) prints as "2.000"
double rounding = 0.50;
for (uint8_t i=0; i<digits; ++i)
```

```
rounding /= 10.00;

number += rounding;

// Extract the integer part of the number and print it

unsigned long int_part = (unsigned long)number;

double remainder = number - (double)int_part;

Serial.print(int_part);

// Print the decimal point, but only if there are digits beyond

if (digits > 00)

Serial.print(".");

// Extract digits from the remainder one at a time

while (digits-- > 0)

{

remainder *= 10.00;

int toPrint = int(remainder);

Serial.print(toPrint);

remainder -= toPrint;

}

}
```

7. For decryption we have made an android app that we install in the destination device which can decrypt the received location code or cipher text to the location link or google map link.

Source Code of Android Studio :

```
package com.example.decrypt;

import androidx.appcompat.app.AppCompatActivity;

import android.os.Bundle;
import android.view.View;
import android.widget.Button;
import android.widget.EditText;
import android.widget.Toast;

public class MainActivity extends AppCompatActivity {
  private Button button;
  private EditText editText1;
  private EditText editText2;


  @Override
  protected void onCreate(Bundle savedInstanceState) {
    super.onCreate(savedInstanceState);
```

```
        setContentView(R.layout.activity_main);



           button = findViewById(R.id.button);
        editText1 = findViewById(R.id.editText1);
        editText2 = findViewById(R.id.editText2);
        button.setOnClickListener(new View.OnClickListener() {
           @Override
           public void onClick(View view) {
              Toast.makeText(MainActivity.this, "Decrypted", Toast.LENGTH_SHORT).show();
              String s = editText1.getText().toString();


              String res = "";
              int i;
              char ch = '\0';
              for(i = 0; i < s.length() ; i++) {
                 ch = s.charAt(i);
                 res = res + (char) (((int) ch) - 3);
              }
              editText2.setText("http://www.google.com/maps?q=loc:"+res);
              }
    }) ;
    } }
```

EXPERIMENTAL RESULTS AND ANALYSIS

The message is sent in an encrypted form. Encryption is done on the Arduino side.

Decryption is done on the client side through the decrypting application.

The location is shown on google maps.

Fig. 2 (Sending message from arduino side and giving this information of sending in serial monitor or Arduino IDE)

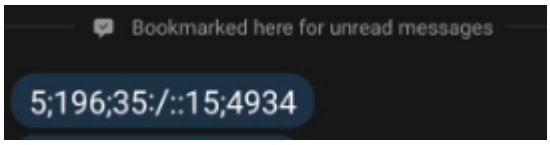


Fig. 3 (Encrypted location information received on the client side in the form of SMS)

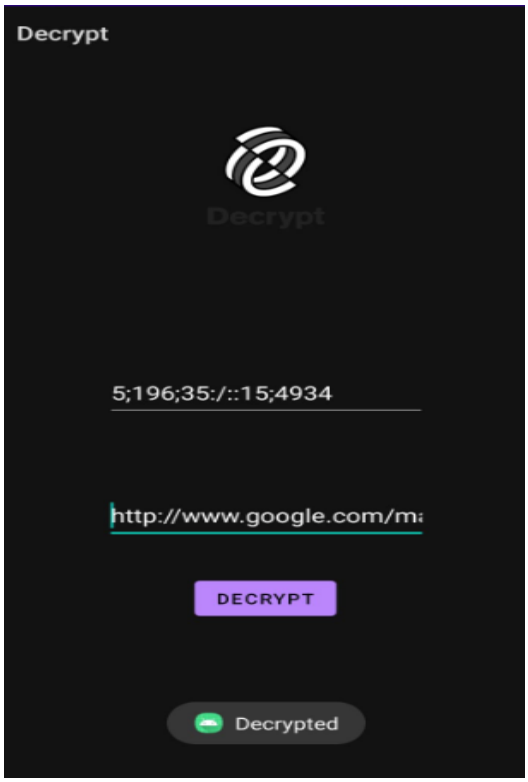


Fig. 4 (This is the location decrypting app window in which client put the encrypted location information and get the decrypted link of location)

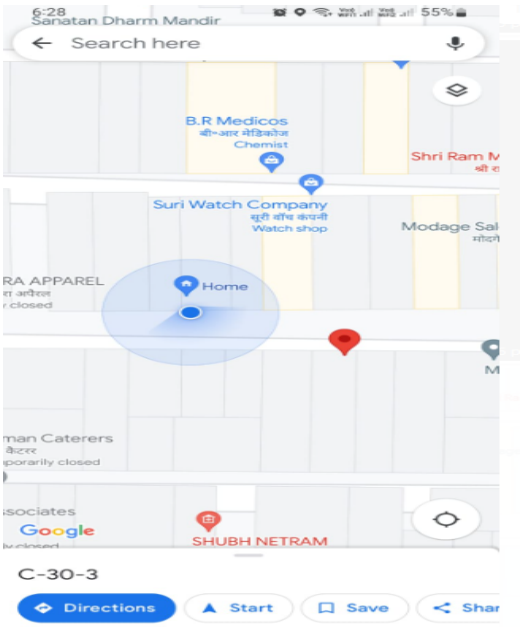


Fig.5 (Link get from the decryption app will show the Location on google maps)

CONCLUSION OF THE REPORT AND FUTURE SCOPE

Any device with a sim card can utilize the GPS tracker gadget, an offline GPS system. The majority of commercially available vehicle tracking technologies are prohibitively expensive. Our project is small and affordable. Users have the option to demand a location. The site is safe and encrypted. The client side performs the decryption.

In the contemporary world, GPS has shown to be one of the greatest tracking technologies.

When it comes to security, it has shown to be a useful tool.

The system's goal is to increase car security through the use of GPS, GSM, and a web application.

In addition, it can help: 1. Parents who look after their kids.

2. tracking wildlife in jungles

3. Services for delivery.

4. The police and fire departments.

The usage of cameras and the creation of a mobile-based application to obtain a real-time view of the car rather than viewing it on a computer could further improve this project and make it more comfortable for the user to monitor the target.

Since memory card functionality is used, it can be challenging to follow our vehicle if it is in a border region where range is limited. When our vehicle approaches the range, the memory card contains all the dimensions, which are displayed.

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PRESENTATION

Vehicle tracking GPS system using GSM sim

Harshit Chopra : 20104013
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Introduction

The real-time tracking information on valuable things and assets could solve many problems in the world. GPS is the Global Positioning System which provides the location, using offline and online both in any circumstances. There are various types of GPS tracking system available in the market. Offline GPS tracking system, GPRS based tracking, SMS-based tracking, Android phone based GPS tracking applications etc.The GPS-based offline tracking and alert system works offline without using the Internet. When the GPS in a device is on the GPS satellites broadcast the signals and GPS receivers uses the signals and provides the latitude, longitude, and altitude information along with the time. A Variety of location tracking devices can be used e.g. Mobile phones, GPS devices, GPS watches etc. With the help of middleware services, it retrieves the location data of the device and upload it to the cloud database and keeps on updating the location automatically within the defined interval of time. GPS in our today's modern world has proved to be one of the best tracking device.It has proved to be a fruitful device in terms of security.

Problem Statement

According to client requirement, GPS tracker device is a GPS based offline and also web application which can be used any device with a sim. Using this system the user can track the location of the target users and visualize positions on a map of the web application. By applying predictive analytics and business intelligence concepts to increase the performance of vehicle tracking system.In general, tracking is a process in which we track the location in form of **Latitude and Longitude** (GPS coordinates).

The objectives of this research are:
1.Track the location of the users.
2.Track location of vehicle.
3.Boost the fleet performance of fleet business owners and productivity.
4.Store the history of location of vehicles.

Most of the vehicle tracking system available in the market is too costly. So, we decided to make our own Tracking system which is inexpensive and compact. Users can request location on demand.

State-of-the-art

1.

The work done by Pradip V Mistary and R H Chile represents tracking system using GPS, GSM modem and microcontroller. The work is implemented for monitoring the movement any time of any equipped vehicle. In this system, GPS receiver receives the location data and convert this data into the data string of NMEA 0183 format in continuously periodic manner. At operator station, the receiver receives and put this reading into the GUI application made in MATLAB.The application contained an algorithm which gets the NMEA reading and converts into degree format suitable for Google earth which is called by using an algorithm. The system can be improved by connecting GSM modem to the GUI, for lower the need of operator and making the system more reliable.

Source:-https://www.researchgate.net/publication/304230277_Real_time_Vehicle_tracking_system_based_on_ARM7_GPS_and_GSM_technology

2.

The work by Iman M. Almomani, Nour Y. Alkhalil, Enas M. Ahmad, Rania M. Jodeh represents the vehicle tracking and management system using GPRS, GSM, the Internet and GPS, essentially helpful for fleet operators in monitoring driving the behavior of employee [8]. The system consists of the web and mobile application for the end user. The developing approach for making this system includes The proposed GPS vehicle tracking system is mainly executed using JAVA 2 Enterprise Edition platform (J2EE5) , JAVA 2 Standard Edition Platform (J2SE 6) and J2ME MIDP (Mobile Information Device Profile), combined with the CLDC (Connected Limited Device Configuration). The SMS alerts are also provided for the notification of the certain events. The system can be improved by increasing the services of the application and improving GUI.
Source:-https://www.researchgate.net/profile/Iman-Almomani/publication/261427884_Ubiquitous_GPS_vehicle_tracking_and_management_system/links/56b4ec2108ae5ad360576ba1/Ubiquitous-GPS-vehicle-tracking-and-management-system.pdf

3.

The work done by Stephen Teang Soo Thong, Chua Tien Han and Tharek Abdul Rahman proposed front-end intelligent and web-based FMS to manage vehicle fleet efficiently and effectively. This implemented work includes an intelligent frontend terminal installed in targeted vehicles which communicate with fleet management control center through GSM channels, which is monitored by using web-based dashboard.

Source:-https://www.researchgate.net/publication/4272135_Intelligent_Fleet_Management_System_with_Concurrent_GPS_GSM_Real-Time_Positioning_Technology

OBJECTIVES AND WORK DISTRIBUTION

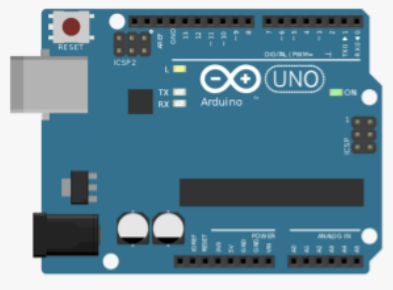
The aim of this thesis is to develop the efficient GPS-based tracking system for tracking the location of the users and vehicles. Using Analytics to the real-time and historic data increases the performance of the system which is helpful to the fleet managers in gaining more profit.

Harshit Chopra : Arduino code
Kartik Gupta : Connection and arduino code
Ayush Sharma : Connection Arduino code

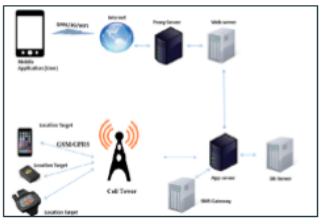
Proposed Design And Implementation

Arduino : Arduino UNO
LCD Display : 16X2 LCD Display
GSM Module : SIM800/900 GSM Module
GPS Module : Neo-6M GPS Module
Connecting Wires : Jumper Wires
Breadboard

Arduino IDE 2.0.0
Android Studio

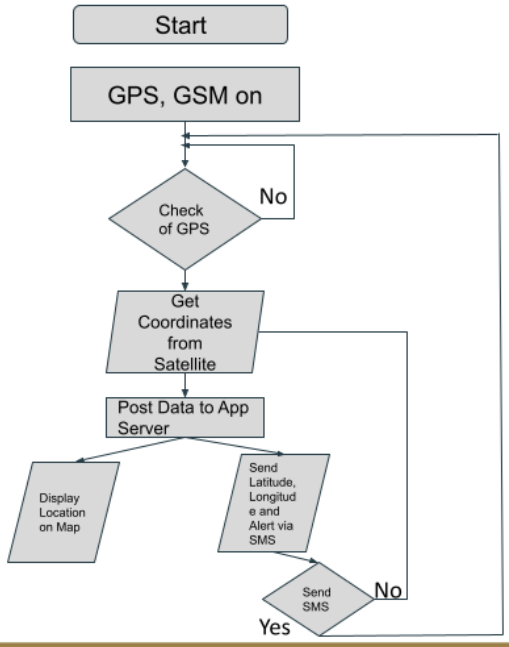


Implementation



We will make the GPS tracker device by using mainly 3 hardware devices - Arduino UNO , GPS Module, GSM Module. We connect these module using breadboard and jumper wire. When the client request for the location by sending the particular message to the SIM connected with the Arduino. Then Arduino command the GPS Module to give the current location and then Arduino will send the location at the client side by using the SIM at its end. We will connect the LED display to show the information about the current state of the Arduino like Message received, Message Send successfully etc.

FLOW CHART



Result and analysis

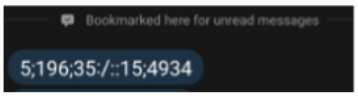
The message is sent in an encrypted form. Encryption is done on the Arduino side.

Decryption is done on the client side through the decrypting application.

The location is shown on google maps.

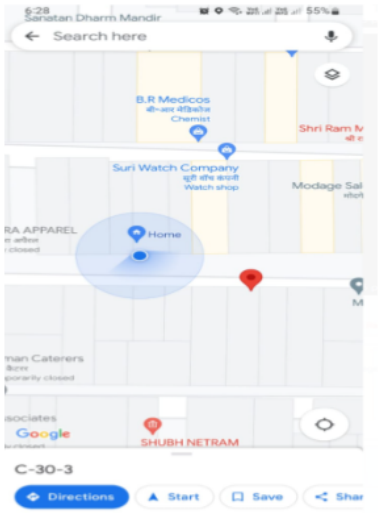
Sending message from arduino side

Message received on client side



Location decrypting app

Location on google maps



Conclusion of the report

GPS tracker device is a GPS based offline system which can be used by any device with a sim. The location is encrypted using an encryption algorithm. Using this system the user can track the location of the target users and visualize positions on a map of the web application.

Most of the vehicle tracking systems available in the market are too costly. Our project is inexpensive and compact. Users can request location on demand. The location is encrypted and secure. It is decrypted on the client side.

GPS in our today's modern world has proved to be one of the best tracking device.It has proved to be a fruitful device in terms of security.

The system is about making vehicles more secure by the use of GPS, GSM technology and a web application.

It can also be beneficial for:

1. Parents look after their children. 2. To track animals in jungles 3. Delivery services. 4. Cops department and fire services.

This project can be further enhanced by the use of cameras and by developing a mobile based application to get the real time view of the vehicle instead of checking it on PC, which would be more convenient for the user to track the target.

Future Scope

1. We can apply the feature by developing the app .
2. Through the app we will encrypt the location coordinates message from the arduino side and decrypt the cipher text at the client side which will make the location coordinates safe
3. Through the app we can introduce the feature of sending the request message send capability from the app only.
4. We can encrypt the request location request message also from the client side and decrypt at the end of the sender side.
5. Extract valuable information from the data which includes performance data, fuel consumption, and its cost data, trends, useful patterns.