

Anti-theft Vehicle Tracking System

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Abstract

Security of assets is a major concern now days and an anti-theft vehicle tracking system is helpful for user to control and manage the vehicle properly. This paper proposes an anti-theft vehicle tracking system using GSM, GPS and a simplified Android application to trace the vehicle. The system 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). Arduino is interfaced with sim808 to fetch and execute the commands. A distinct Android application is used to invoke the hardware and track the vehicle location using latitude and longitude fetched by Sim808. The shortest path between your location and fetched location is calculated by haversine formula

Keywords — Vehicle tracking, GPS, GSM, Android application

I. INTRODUCTION

Vehicle tracking system can be used for both heavy commercial vehicles as well as light commercial vehicles. GPS tracking for vehicles is widely used in logistics, however other companies also use it to track their own cars, ensuring that employees are not using them for their own, but only for business purposes. Other areas that actively use GPS tracking systems include public transport, car rental and goods transportation, companies that use agriculture, building and other special machinery.

The application gives you the access to vehicle location on your handheld device i.e. your mobile phone. The point of concern in this project is to provide security to vehicles as vehicle theft rate is increasing day by day. Vehicle owner is not sure whether the vehicle is safe or not. As far as various conditions for vehicle tracking are under consideration the optimal solution for vehicle tracking is to develop a system which will enable the vehicle owner to track the vehicle in cost effective manner.

Haversine formula is used to determine geographic relation between two points on sphere (earth).

II. RELATED WORK

The major part of exploration for the particular project is to create a vehicle tracking system with minimum possible cost and maximum accuracy. The study was mainly focused on the use of sim808. In many previous research works global positioning system (GPS) is commonly used as global navigation satellite system is used to locate the vehicles and also to stop the vehicle if stolen. The location information is sent in the form of message containing latitude, longitude and speed information to the owner of the vehicle or location can also be traced using internet through Google maps [1].

III. SYSTEM OVERVIEW

The system consists of two parts hardware components and Android application. The hardware is installed onto the vehicle which gets real-time location from the GPS Satellite. The hardware is also used for GSM communication between mobile phone and hardware component.

Second part of system is android application which is consist of two main functionalities 1) invoking hardware module using. 2) Tracking vehicle location using Google map.

IV. TECHNICAL SPECIFICATION

1) Hardware Specification –

- i. **Arduino-** Arduino is an open-source platform used for building electronics projects. Arduino consists of both a physical programmable circuit board (often referred to as a microcontroller) and a piece of software, or IDE (Integrated Development Environment) that runs on your computer, used to write and upload computer code to the physical board. the Arduino IDE uses a simplified version of embedded C, making it easier to learn to

program. Finally, Arduino provides a standard form factor that breaks out the functions of the micro-controller into a more accessible package.

- ii. **SIM808** – SIM808 module is a complete Quad-Band GSM/GPRS module which combines GPS technology for satellite navigation.[3] The compact design which integrated GPRS and GPS in a SMT package will significantly save both time and costs for customers to develop GPS enabled applications. Featuring an industry-standard interface and GPS function, it allows variable assets to be tracked seamlessly at any location and anytime with signal coverage.[5]
- iii. **GSM Technology** - GSM (Global System for Mobile communication) is a digital mobile network that is widely used by mobile phone users in Europe and other parts of the world. GSM uses a variation of time division multiple access (TDMA) and is the most widely used of the three digital wireless telephony technologies: TDMA, GSM and code-division multiple access (CDMA). GSM digitizes and compresses data, then sends it down a channel with two other streams of user data, each in its own time slot. It operates at either the 900 megahertz (MHz) or 1,800 MHz frequency band. [6]
- iv. **GPS Technology** - The Global Positioning System (GPS), originally Navstar GPS is a satellite-based radionavigation system owned by the United States government and operated by the United States Air Force.[2] It is a global navigation satellite system that provides geolocation and time information to a GPS receiver anywhere on or near the Earth where there is an unobstructed line of sight to four or more GPS satellites. Obstacles such as mountains and buildings block the relatively weak GPS signals. The GPS does not require the user to transmit any data, and it operates independently of any telephonic or internet reception, though these technologies can enhance the usefulness of the GPS positioning information. The GPS provides critical positioning capabilities to military, civil, and commercial users around the world. The United States government created the system, maintains it, and makes it freely accessible to anyone with a GPS receiver.[7]

2) Software Specification –

- i. **Android application** - A distinct android application is developed to activate the hardware module using simple call. Also the app is used to locate the vehicle using google maps. The application is intended to show the path between your location and vehicle location. The application is suitable and easy to use for any user.
- ii. **Haversine formula** - The **Haversine** formula calculates the shortest distance between two points on a sphere using their latitudes and longitudes measured along the surface[8]. It is important for use in navigation. The haversine can be expressed in trigonometric function.
Central angle Haversine can be computed, between two points with r as radius of earth, d as the distance between two points, ϕ_1, ϕ_2 is latitude of two points and λ_1, λ_2 is longitude of two points respectively, as:

$$\text{haversin}\left(\frac{d}{r}\right) = \text{haversin}(\phi_2 - \phi_1) + \cos(\phi_1) \cos(\phi_2) \text{haversin}(\lambda_2 - \lambda_1)$$

V. IMPLEMENTAION-

The proposed system is consist of Arduino UNO which is used to execute the command and to control sim808. Sim808 consist of GPS and GSM technology. At the other end a mobile phone is connected to hardware module using GSM to activate and keep track of vehicle.

Hardware interfacing is done Using Arduino IDE. Various activities done by the hardware module are controlled by Arduino.

Android Application is built using Android studio and java

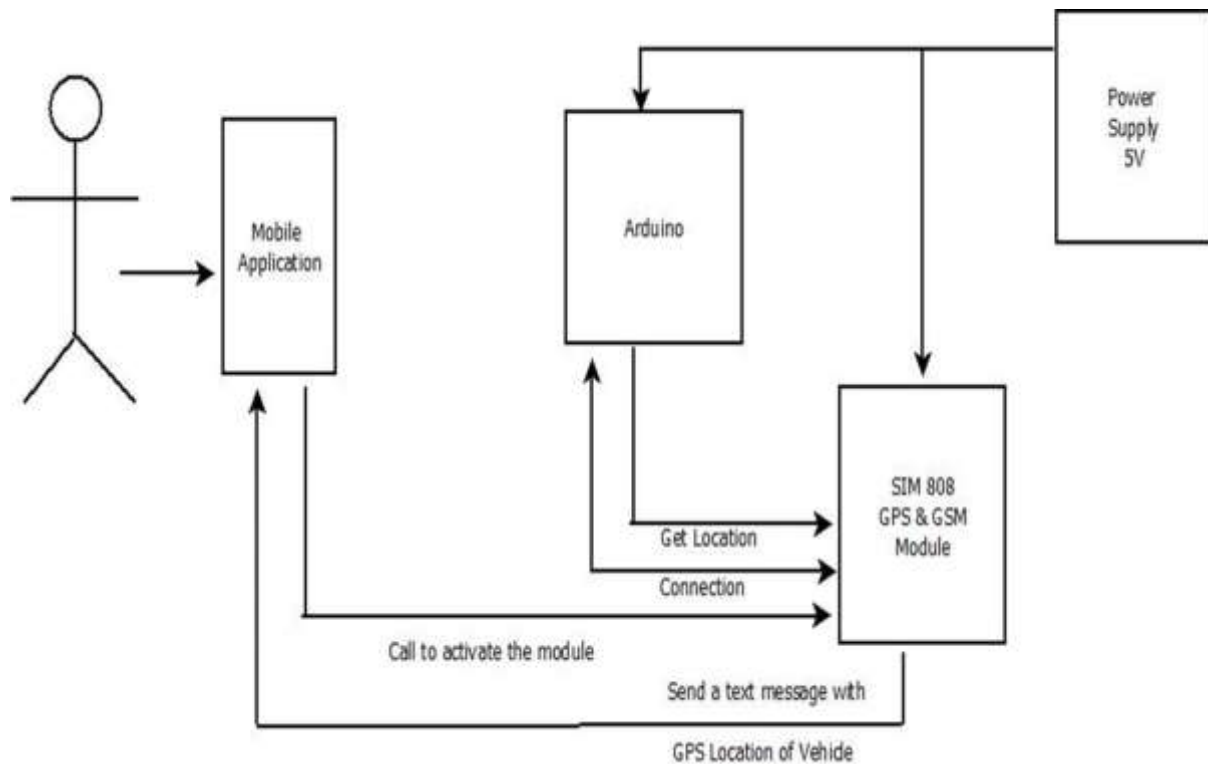
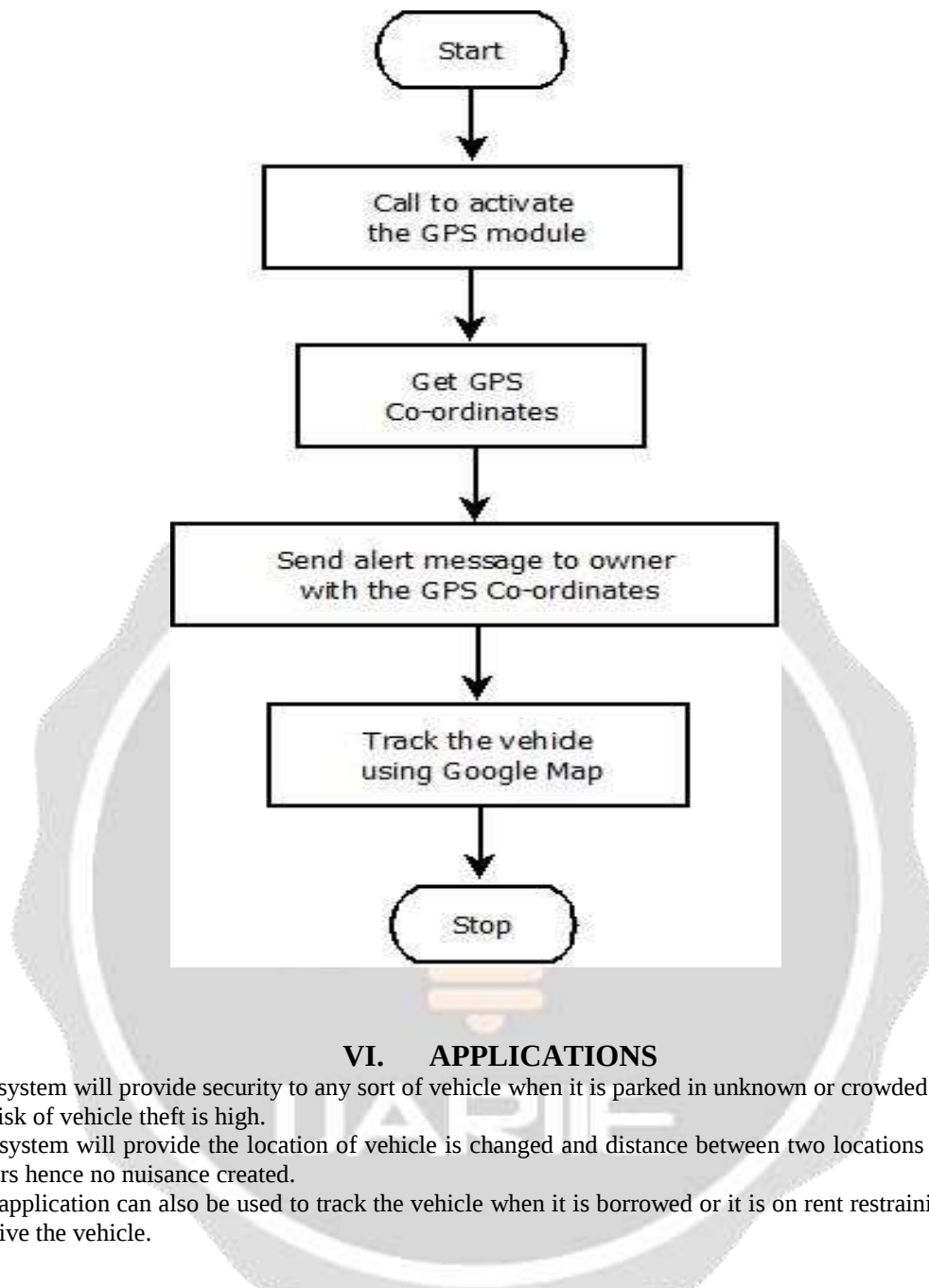


Figure i: Architecture of proposed system

• Flow of proposed system-

- I. Vehicle owner make a call through mobile application to activate the module and to fetch the fixed parking location.
- II. Current parking location (latitude and longitude) are stored in variables.
- III. Vehicle location is checked after an interval of 5 min.
- IV. Each time the vehicle location is checked the distance between the latitude and longitude is calculated using Haversine formula.
- V. If the distance exceeds 50 meters alert message is sent to user using GSM services.
- VI. User can access the vehicle location through the mobile application which is specially designed for proposed system.
- VII. User also can get the path between it is location and vehicles location so that it will be easy for the user to reach it's vehicle as early as possible.



VI. APPLICATIONS

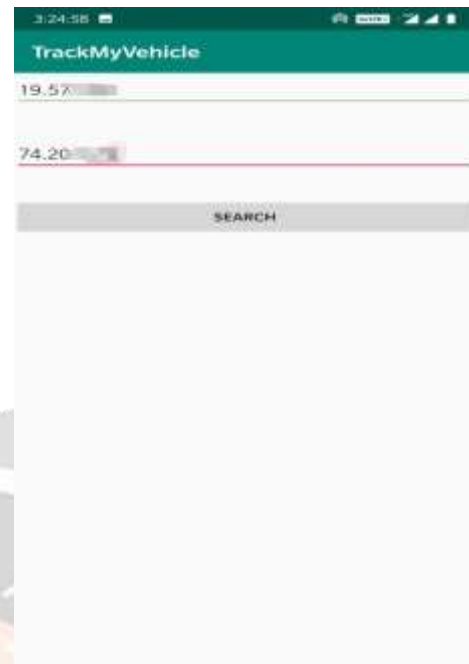
- 1) The system will provide security to any sort of vehicle when it is parked in unknown or crowded area where the risk of vehicle theft is high.
- 2) The system will provide the location of vehicle is changed and distance between two locations exceeds 50 meters hence no nuisance created.
- 3) The application can also be used to track the vehicle when it is borrowed or it is on rent restraining the area to drive the vehicle.

VII. RESULTS

The system is invoked using call which is done through the specific mobile application which also used for tracking the vehicle location through google map.

When the location of vehicle is changed user id notified through message.

Here are some snapshots:

1: Hardware setup**2 : Enter latitude and longitude****3: Get location****4: Runtime location and calculated distance**

VIII. FUTURE SCOPE

Anti-theft vehicle tracking system has a wide area for future scope for example. The system could be integrated with the vehicle machineries to put a lock on the fuel consumption or to turn off the vehicle motor. Proposed system provides security to vehicle when it is at standby mode. The vehicle might have some risks when it is turned on this system might be further enhanced with some speed control and vibration control techniques.

The system can be further developed for the recognition of suspicious activities done with your vehicle and to provide alert for the same. We also can integrate the system using a Camera so that we can track the intruder and intruder activities.

IX. CONCLUSION

As the number of vehicle is increasing hence vehicle security is also a part of major concern. In, this paper, a system is developed to track the vehicle location and send an alert message to owner as intimation. Hence Owner can take appropriate action to save or regain the vehicle and to secure it from being theft. Installing such system onto your vehicle can protect it from the unsafe environment and help us to decrease the vehicle theft rate

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