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Android Application for Vehicle Theft Prevention and Tracking System

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***Abstract*— with increasing need for better vehicle security, there is now a strong emphasis on developing measures to prevent theft or misuse of vehicles. Of the measures that have been developed so far, the usage of a tracking system has by far been the most popular and efficient. Vehicle Tracking System aims at determining the location of a vehicle using different methods like GPS and GSM systems operating through satellites and ground based stations. Vehicle information like location details, speed, distance travelled etc. can be viewed on a Google map with the help of APIs via Internet. This system is an important tool for tracking registered vehicles at any given period of time and is now becoming increasingly popular as a theft prevention and retrieval device. The vehicle tracking system installed within the vehicle sends an SMS containing the GPS coordinates to the user, using which he tracks the vehicle on Google Earth. The user can forward the SMS containing the GPS coordinates to his close friends and relatives if he wishes to, so that they can also track the vehicle using Google Earth.**

Keywords*— *Global Positioning System, Global System of Mobile
Introduction

I. INTRODUCTION

Despite the various technologies that have been introduced in recent years to deter car thefts and tracking it, It was reported that as many as cars were stolen yearly in the world. According to National Crime Information Centre (NCIC), in 2006, 1,192,809 motor vehicles were reported stolen, the losses were 7.9$ billion.

Several security and tracking systems are designed to assist corporations with large number of vehicles and several usage purposes. A fleet management system can minimize the cost and effort of employees to finish road assignments within a minimal time. Besides, assignments can be scheduled in advanced based on current vehicles location. Therefore, central fleet management is essential to large enterprises to meet the varying requirements of customers and to improve the productivity.

However, there are still some security gaps where these technologies don't prevent a vehicle from theft, don't assist to recover it and don't allow the users to know the status of their vehicles. They can't permit the owner to communicate with the vehicle online, even if the owner is certain that his vehicle was stolen.

In wireless data transporting, GSM and SMS technology is a common feature with all mobile network service providers. Utilization of SMS technology has become popular because it is an inexpensive, convenient and accessible way of transferring and receiving data with high reliability.

II. RELATED WORK

In [1], the hardware and software of the GPS and GSM network were developed. The proposed GPS/GSM based System has the two parts, first is a mobile unit and another is controlling station. The system processes, interfaces, connections, data transmission and reception of data among the mobile unit and control stations are working successfully. These results are compatible with GPS technologies.

In [2], a vehicle tracking system is an electronic device, installed in a vehicle to enable the owner or a third party to track the vehicle's place. This paper proposed to design a vehicle tracking system that works using GPS and GSM technology. This system built based on embedded system, 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 watch a moving Vehicle and report the status of the Vehicle on demand.

In [3], Face Detection System used to detect the face of the driver, and compare with the predefined face. The car owner is sleeping during the night time and someone theft the car. Then Face Detection System obtains images by one tiny web camera, which is hidden easily in somewhere in the car. Face Detection System compared the obtained images with the stored images. If the images don't match, then the information sends to the owner through MMS. The owners get the images of the thief in mobile phone and trace the place through GPS. The place of the car and its speed displayed to the owner through SMS. The owner can recognize the thief images as well as the place of the car and can easily find out the hijackers image. This system applied in our day-to-day life.

In [4], this system provided vehicle cabin safety, security based on embedded system by modifying the existing modules. This method monitors the level of the toxic gases such as CO, LPG and alcohol within the vehicle provided alert information as alarm during the dangerous situations. The SMS sends to the authorized person through the GSM. In this method, the IR Sensor used to detect the static obstacle in front of the vehicle and the vehicle stopped if

any obstacle detected. This is avoiding accidents due to collision of vehicles with any static obstacles.

In [5], Kai-Tai Song and Chih-Chieh Yang have designed and built on a real-time visual tracking system for vehicle safety applications. In this paper built a novel feature-based vehicle-tracking algorithm, automatically detect and track several moving objects, like cars and motorcycles, ahead of the tracking vehicle. Joint with the concept of focus of expansion (FOE) and view analysis, the built system can segment features of moving objects from moving background and offer a collision word of warning on real-time. The proposed algorithm using a CMOS image sensor and NMOS embedded processor architecture. The constructed stand-alone visual tracking system validated in real road tests. The results provided information of collision warning in urban artery with speed about 60 km/hour both at night and day times.

In [6], the remote monitoring system based on SMS and GSM was implemented. Based on the total design of the system, the hardware and software designed. In this paper, the GSM network is a medium for transmitting the remote signal. This includes two parts that are the monitoring centre and the remote monitoring station. The monitoring centres consist of a computer and communication module of GSM.

III MATERIALS AND METHODS

A simple system has been designed which helps the user exploit the working of multiple processors in parallel. The system consists of modern hardware and software components enabling one mobile to track their vehicle online or offline. The Android mobile within the vehicle receives the latitudinal information from the satellite through GPS and the GPRS enabled sim sends message to the other sim. The user interface is on another Android mobile where the user can track the vehicle on Google map. The entire document should be in Times New Roman or Times font. Type 3 fonts must not be used. Other font types may be used if needed for special purposes.

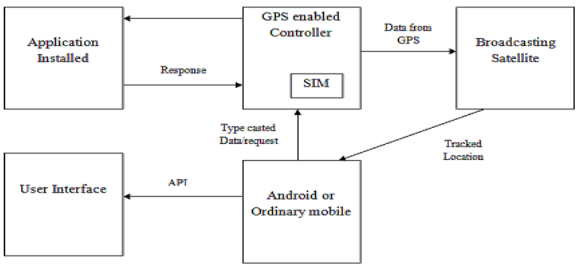


Fig. 1 system architecture

The vehicle tracking application is installed in the android mobile of the owner. There is a GSM modem in the vehicle tracking and locking system installed in the vehicle. As soon as the engine starts the system installed in the vehicle sends a confirmation message to the owner using the sim in the GSM modem. In case there is a theft the owner can react accordingly using the application installed in his android phone.

There are 4 buttons in the app

1. Lock
2. View
3. Alert
4. Unlock

Lock button is used to lock the vehicle

View button is used to view the current location of the vehicle

Alert button is used to alert the owner's close friends and relatives which is optional

Unlock button is used to unlock the locked vehicle

The data is sent from GPS to the broadcasting satellite. The GPS receiver in the system installed within the vehicle then retrieves the location information from the satellites in the form of latitude and longitude readings in real time which is sent in the form of a message to the owner's android mobile using which the owner can track the current location of his vehicle using Google earth.

The owner sends messages using his android phone to the GSM modem in the system installed within the vehicle to successfully retrieve his vehicle. The user interface is on the owner's Android mobile where the user can track the vehicle on Google map.

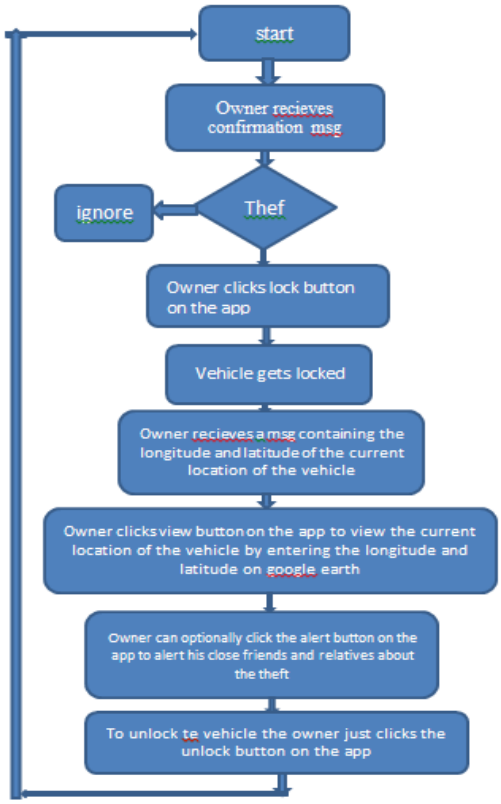


Fig. 2 Android application flow chart

When the engine starts the owner of the vehicle receives a confirmation message saying 'engine on'. If an intruder has started the car the owner clicks the lock button on the anti-theft app installed on his android phone else he simply ignores the msg. when anti-theft system installed in the vehicle receives the lock message, it locks the vehicle instantly and sends a message containing the longitude and latitude of the current location of the vehicle.

The owner then clicks the view button on the app and enters the longitude and latitude to track the vehicle using Google earth. The owner can optionally alert his close friends and relatives by clicking the alert button on the app which will notify his close friends and relatives about the theft

After tracing and retrieving his vehicle successfully the user can unlock the car by just clicking the unlock button on the app which will unlock the vehicle and once the vehicle starts the same procedure begins.

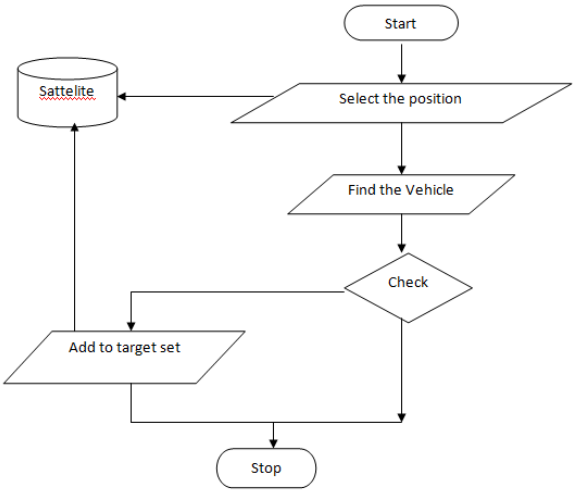


Fig. 3 GPS tracking flow chart

After starting the application we select the position of the vehicle and send the data to the satellite and then we find the vehicle using the GPS coordinates sent by the satellite, after which we verify if they found vehicle is that of the owner.

If the vehicle is that of the owner we stop otherwise we add the data to the target set which is then sent to the satellite.

IV IMPLEMENTATION

Implementation of any software is always preceded by important decisions regarding selection of the platform, the language used, etc. these decisions are often influenced by several factors such as real environment in which the system works, the speed that is required, the security concerns, and other implementation specific details. There are three major implementation decisions that have been made before the implementation of this project. They are as follows:

1. Selection of the platform (Operating System).
2. Selection of the programming language for development of the application.
3. Coding guidelines to be followed.

A. Selection of the platform

Android is a software stack for mobile devices that includes an operating system, middleware and key applications. The Android SDK provides the tools and APIs necessary to begin developing applications on the Android platform using the Java programming language. Android contains its own Java Virtual machine called (Dalvik Virtual Machine - DVM). Android is created by the Open Handset Alliance which is lead by Google. It is based on the Linux operating system and developed by Google. Android supports 2-D and 3-D graphics using the OpenGL libraries and supports data storage in a SQLite database.

Dalvik Virtual Machine is a virtual machine it contain some uses special byte code. Therefore we cannot run standard Java byte code on Android. Android provides a tool "dx" which allows converting Java Class files into "dex" (Dalvik Executable) files

B. Android features

1. Application framework: It is used to enabling reuse and replacement of components.
2. Dalvik virtual machine: Dalvik virtual machine (DVM) is a process virtual machine which is part of an open source the Android mobile phone platform based on the Linux operating system and is developed by the (Open Handset Alliance).
3. Optimized graphics: It contains both 2D and 3D. 2D is based on graphics library and 3D is based on OpenGL ES
4. SQLite: It is used to data storage in database.
5. Media support : It contains audio, video, and still image formats (MPEG4,JPG, PNG, GIF).
6. GSM Telephony**:** (hardware dependent)
7. Bluetooth, EDGE, 3G, and Wi-Fi (hardware dependent)
8. Camera, GPS, compass, and accelerometer (hardware dependent).

C. Android Components

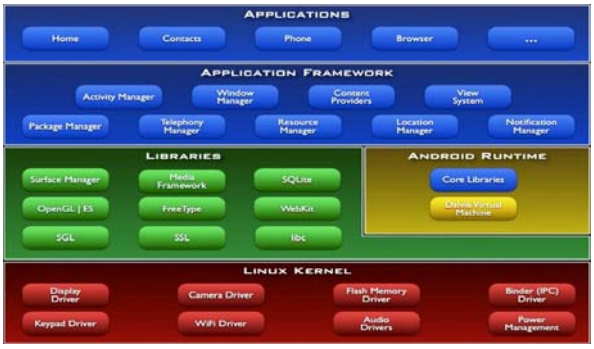
An Android application consists out of the following parts:

1. Activity - represents the presentation layer of an Android application, e.g. a screen which the user sees. An Android application can have several activities and it can be switched between them during runtime of the application.
2. Views - the User interface of an Activity is built with widget classes which inherit from android. view. The layout of the views is managed by android. view. View Groups. Views often have attributes which can be used to change their appearance and behaviour.
3. Services - perform background tasks without providing an UI. They can notify the user via the notification framework in Android.
4. Content Provider - provides data to applications, via a content provider your application can share data with other applications. Android contains a SQLite DB which can serve as data provider
5. Intents - are asynchronous messages which allow the application to request functionality from other services or activities. An application can call directly a service or activity (explicit intent) or ask the Android system for registered services and applications for intent (implicit intents). For example the application could ask via an intent for

a contact application. Applications register themselves to an intent via an Intent Filter. Intents are a powerful concept as they allow the creation of loosely coupled applications.

6. Broadcast Receiver - receives system messages and implicit intents, can be used to react to changed conditions in the system. An application can register as a Broadcast Receiver for certain events and can be started if such an event occurs.
7. Widgets - interactive components primary used on the Android home screen to display certain data and to allow the user to have quick access the information.

IV ANDROID ARCHITECTURE



Applications: These are applications written in Java. Some of basic applications include a calendar, email client, SMS program, maps, making phone calls, accessing the Web browser, accessing your contacts list and others.If you are an average user, this is the layer you will us most, rest all layers are used by Google programmers, developers and hardware manufacturers.

Application Framework: This is the skeleton or framework which all android developers has to follow. The developers can access all framework APIs an manage phone's basic functions like resource allocation, switching between processes or programs, telephone applications, and keeping track of the phone's physical location.

V SCREEN SHOTS

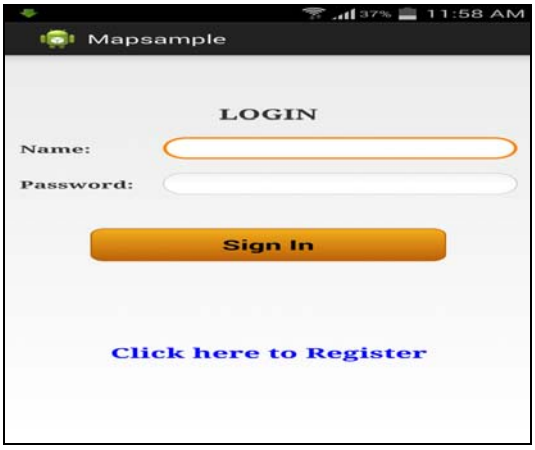


Fig. 4 Login Page

This is the first page in application. First we need to register by clicking on the register button. In case you have already registered you can directly login by entering your valid name and password

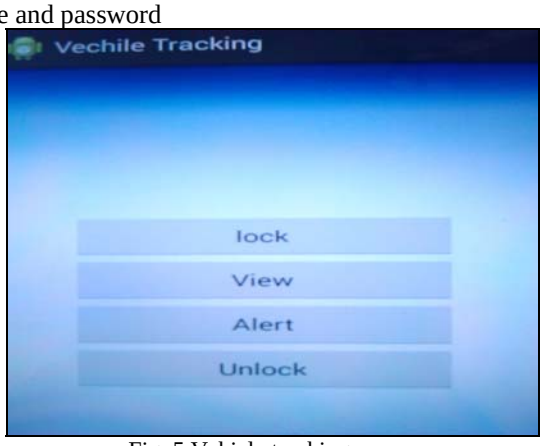


Fig. 5 Vehicle tracking screen

These are the four buttons which the user uses to control the vehicle

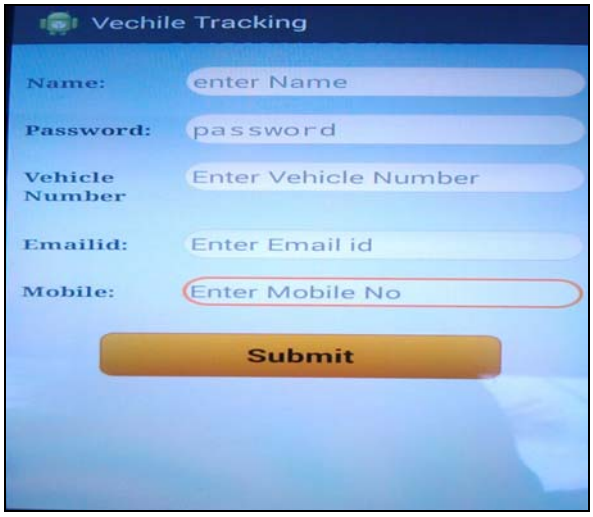


Fig. 6. Registration Page

If you are a new user you need to register by entering the required details on the page

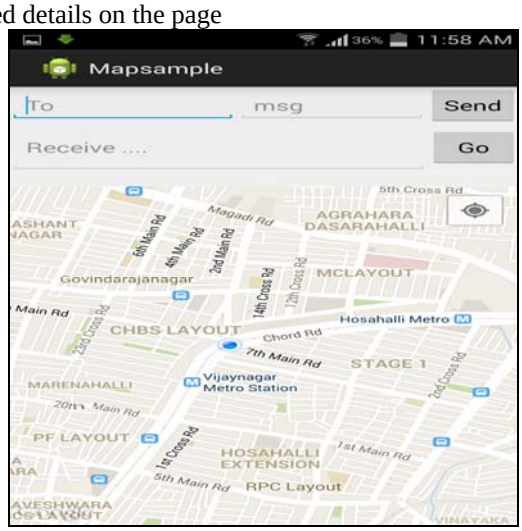


Fig. 7. View Page

Here we enter latitude and longitude to track the current location of the vehicle

VI CONCLUSIONS

In this paper, a low-cost vehicle tracking and monitoring system is presented. The application included a transmitting module which contains an embedded system to combine GPS and GSM devices to retrieve location and vehicle status information and send it to the other stationary module; the second part is the receiving module which collects the transmitted information by SMS and process it to a compatible format to Google Earth to view the location and vehicle status online.

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