AUTOMATED WEB BASED CRIME TRACKING SYSTEM

(A CASE STUDY OF NIGERIA POLICE FORCE)

BY

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CERTIFICATION

We hereby certify that this work title “Tracking Device: A Case Study of Vehicle” was carried out by **ABUBAKARLUKMAN (ICT/2252070178), IBALE MATTHEW FRIDAY (ICT/225200617)** and **MAMUDUABDULRASHEED (ICT/2252050708)** under our supervision in the Department of Computer Science, School of Information and Communication Technology, Auchi Polytechnic Auchi, Edo State.

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DEDICATION

This project work is dedicated to God Almighty God for the giver of life and for giving us the strength to complete this project work.

ACKNOWLEDGEMENT

We give thanks to God Almighty the maker of the universe for my life and also making me to accomplish my goal in life, also for giving me the strength and determination to put this project work together.

Special regard to our parent for their love support throughout our stay in school. And to our friends, siblings who have made this project a great success.

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ABSTRACT

Technology has changed the way people communicate and do business with each other. Tracking technology has evolved from the developments in personal computers, mobile phones, the GPS Global Positioning System and the Internet into what is now described as "vehicle telematics". In this section we would like to focus on vehicle tracking as the "use of computers and telecommunications to enhance the functionality, productivity and security of both vehicles and drivers". This can also be described as the technology of tracking the movements and/or status of a vehicle or fleet of vehicles, through the use of a vehicle tracking device, typically equipped with a GPS Locator and GPRS modem, which is fitted in the vehicle.

Keywords: technology, tracking, GPS, security, vehicle.

CHAPTER ONE

1.0 Introduction

Today, the world feels insecure the environment knows no peace and the people can't sleep with even one of their eyes closed. Security in general is a major concern in our society today. Every day, people purchase vehicles for different purposes, but for which ever reason, a lot of money is spent in the transaction which demands that adequate provision should be provided for its security and safety (Bajaja et al. 2012). Auto theft is a serious crime which is getting rampant day after day. It is then necessary for car users everywhere to have a way to track down their cars in case it is ever stolen. Real Time Vehicle Tracking System is one of the measures of securing vehicles. The word tracking means to find or follow something, therefore, Real time vehicle tracking is a method used to track and monitor any remote vehicle equipped with a hardware unit that receives and transfers signals through global positioning system (GPS) satellite. It makes use of GPS to provide actual geographic real time position of each vehicle. A vehicle tracker is therefore a major and essential device that should be in every vehicle because it gives the owner the ability to know the exact location of such cars at any point in time anywhere in the world with geography information systems (GIS) (Ambade et al. 2011). It is very useful for both individuals and companies.

1.1 Background of the Study

The vehicle tracking system is a total security and fleet management solution. It is the technology used to determine the location of a vehicle using different methods like GPS and other navigation system operating via satellite and ground based stations. Modern vehicle tracking system uses GPS technology to monitor and locate our vehicle anywhere on earth, but sometimes different types of automatic vehicle location technology are also used. The vehicle tracking system is fitted inside the car that provides location and the data can even be stored and downloaded to a computer which can be used for analysis in future. This system is an essential device for tracking car any time the owner wants to monitor it and today it is extremely popular among people having expensive cars, used as theft prevention and recovery of the stolen car. The data collected can be viewed via SMS [receiving the position coordinate] or on electronic maps via internet and software (Kunal, 2006).

1.2 Problem Definition

Security is the topmost priority of any individual, group. This outlines security focus on cars for mitigating security risks to car owners. The ultimate goal of the security system is to prevent access to intruders thereby protecting the monitored device. This helps safeguard property of individuals, groups and organizations. The

alarming increase in theft and related cases of intruders has necessitated the improvement on security infrastructure. Without a car tracker system with code using GSM, there may be chances of someone not getting a stolen vehicle back. The objective of a car tracker system with code using GSM is to give its users the reassurance that they will definitely have their car restored in a shorter time.

1.3 Aim and Objectives

1.3.1 Aim

The aim of a car tracking systemis to have a reliable and highly precise security means to ensure the safety of vehicles. If the vehicle was snatched, the device can help make searching more efficient.

1.3.2 Objectives

The objectives of this project are:

i. To develop a car tracking system that will ensure safety or easy recovery or stolen cars.
ii. To develop a car tracking system that will be easy to monitor cars.

1.4 Significance of Study

i. **Preventing Car Theft:** Being an excellent anti-theft device is one of the uses of GPS. Installing tracking device on vehicles will allow you to trace and locate it in case your car is stolen by someone. There are already several reports of recovered stolen vehicles, thanks to GPS technology.

ii. **Mapping and Surveying:** GPS can also be used in mapping and surveying project. The use of GPS in surveying saves companies time and cost. This is the best way to survey positions in the shortest time possible. E.g. highways, rivers etc.

iii. **Tracking for Law Enforcement:** The police also take advantage of the uses of GPS. These devices can also be used by police and investigators in catching criminals using GPS tracking. The authorities will just have to slickly attach a tiny GPS tracking device on the suspect's vehicle to track the crime location. GPS can help them collect useful evidences.

iv. **Fleet Tracking**: Companies that use GPS fleet tracking devices on their fleets to track their vehicle's routes gain a lot of benefits including cutting down on fuel and operation cost, which lead to the increase of overall efficiency of the company. Real-time vehicle tracking also guarantees the safety of taxi passengers.

1.5 Scope of the Study

The car tracker is use to immobilize or demobilize a vehicle when the authorized user calls the vehicle security number through a GSM mobile cell phone. Only the coded users/numbers can control the vehicle through their GSM phone. The GSM hardware system of the car tracker enables the mobile service provider to know the position of the vehicle anywhere in the world through their network using GSM tower triangulation.

1.6 Research Methodology

Good system engineering begins with a clear understanding of the context, the world view and then progressively narrows until technical detail is achieve (Pressman, 2005).

The research methodology adopted in this work is design science approach (Herneretal, 2005, march and smith, 1995). In this approach, the first step is to identify the existence of a problem that requires viable solution.

i. Initial investigation was carried out through interaction and enquiries with technology users and domain experts to establish the existence of real life problems that requires technical solutions by way of deploying available IT appliances.

ii. A review of related literature was carried out the established research domain of interest such as research journals, product manuals, books and related technical materials.

iii. Key concepts were identified, defined and research objectives written.

iv. Thereafter a case study was selected using a vehicle to establish the technical feasibility of the deployment of car tracking to provide solution to the established real life problem.

1.7 Research Approach

We went through literature on tracking device, by visiting a tracking device technician for the procedure for using and installing a tracking device on vehicles.

CHAPTER TWO

2.0 Literature Review

Over time, the security of vehicles has become a priority. Various inventions and technologies have been brought about to put minds at rest, but the complete eradication of theft of cars is much of a tedious task. Technologies like the car alarm system have been put in place but it is limited to an audible distance and it doesn't give the location of the car if it is successfully stolen. A solution to knowing the location of vehicles when they are stolen is the Real Time Vehicle Tracking System that involves the installation of a vehicle tracker in a hidden position in the vehicle so that it is not easily located while providing essential clues as to the location of the vehicle. The Global Positioning System (GPS) is the only fully-functional satellite navigation system. More than two dozen GPS satellites orbit the Earth, transmitting radio signals which allow GPS receivers to determine their location, speed and direction. GPS has become indispensable for navigation around the world and an important tool for map-making and synchronization of telecommunications networks. (Khindker, 2009) It provides location and time information in all weather conditions, anywhere on or near the Earth where there is an unobstructed line of sight to four or more GPS satellites. A GPS receiver knows the location of the satellites because that information is included in satellite transmissions.

2.1 Tracking system

A tracking system, also known as a locating system, is used for the observing of persons or objects on the move and supplying a timely ordered sequence of location data for further processing. By using different system GPS with its own features and software (Kamel, 2012).

2.1.1 Different Technologies used in Tracking System

Passive Tracking System: Passive System monitors location and stores its data on journeys based on certain types of events. So, for example, this kind of GPS system may log data such as turning the ignition on or off or opening and closing doors. The data stored on this kind of GPS tracking system is usually stored in internal memory or on a memory card which can then be downloaded to a computer at a later date for analysis. In some cases the data can be sent automatically for wireless download at predetermined points/times or can be requested at specific points during the journey.

Active Tracking System: Active System is also known as a real-time system as this method automatically sends the information on the GPS system to a central computer or system in real-time as it happens. This kind of system is usually a better option for commercial purposes such as fleet tracking and individual vehicle tracking as it allows the company to know exactly where their vehicles are,

whether they are on time and whether they are where they are supposed to be during a journey. This is also a useful way of monitoring the behaviour of employees as they carry out their work and of streamlining internal processes and procedures for delivery fleets.

2.1.2 Features of the GPS Tracking System

Generally all of the GPS Tracking System has some of the common features that are listed below:-

1. **GSM/GPRS Module:** It is used to send the location to the user online. In some case, if the user wants the location through the internet then this module is very useful. By the help of the
2. **Track Playback:** Animates your driver's daily driven route so that you can follow every move. The track animation line is colour coded to indicate the speed your driver was travelling during his route.
3. **Idle Time Report:** Gives you an accurate report detailing when your driver was stopped and has left the engine running on the vehicle. This report was designed with input from our existing customers who were concerned about high fuel bills.
4. **Track Detail:** Provides you with a split screen view when reviewing your driver's route. Stop and transit times, as well as speed information, are

displayed in the bottom pane. You can easily toggle between stops by clicking the stop number on the track detail pane.

5. **Geo Fencing:** It allows us to limit some region of area and if your vehicle goes beyond the boundary of that region then urgent message will be sent by the system to the manager to control the driver. So that the time and money can be saved by this system.
6. **Ignition ON/OFF Detection:** The system can save the information about the engine that it is in working condition or stop by ignition ON/OFF detection so that the manager can know for how many times the driver stopped the fleet and for how many time. So much time can be saved.
7. **SMS / GPRS Communication:** The location about the fleet or the person can be send by SMS or email by this facility.
8. **On-Line and Off Line Tracking:** Every user has different requirement and as per the requirement the data can be viewed real time or it can be saved in the unit and when the vehicle reach to its manager, manager can download data and see the route of the vehicle and every other detail that can be seen by the real time.
9. **Buzzer for Alerting the Driver:** Some system uses the buzzer system to alert the driver that he is going out of the boundary or the speed is very high,

or anything that is restricted. So that the driver is able to know that he is going wrong.

2.2 History of Global Positioning System (GPS)

The GPS System was created and realized by the American Department of Defense (DOD) andwas originally based on and run with 24 satellites (21 satellites being required and 3 satellites asreplacement). In 1973, Decision has been made to develop a satellite navigation system basedon the systemsTRANSIT, TIMATION and 621B of the U.S. Air Force and the U.S. Navy. Four years later,First receiver tests are performed even before the first satellites are stationed in the orbit.Transmitters are installed on the earth's surface called Pseudolites (Pseudo satellites). By 1985,a total of 11 Block I satellites are launched into the orbit. Decision has been made to expand theGPS system. Thereupon the resources are considerably shortened and the program isrestructured. At first only 18 satellites should be operated. 1988 the number of satellites is againraised to 24, as the functionality is not satisfying with only 18 satellites.

2.3 GSMTechnology

GSM is a cellular network, which means that mobile phones connect to it by searching for cellsin the immediate vicinity. GSM networks operate in four different frequency ranges. Most GSMnetworks operate in the 900 MHz or 1800

MHz bands. Some countries in the Americas(including Canada and the United States) use the 850 MHz and 1900 MHz bands because the900 and 1800 MHz frequency bands were already allocated (Al-Hindawi, 2012).

GSM has used a variety of voice codecs to squeeze 3.1 kHz audio into between 5.6 and 13Kbit/s. Originally, two codecs, named after the types of data channel they were allocated, wereused, called Half Rate (5.6 Kbit/s) and Full Rate (13 Kbit/s). These used a system based uponlinear predictive coding (LPC). In addition to being efficient with bitrates, these codecs alsomade it easier to identify more important parts of the audio, allowing the air interface layer toprioritize and better protect these parts of the signal

2.4 GSMModem

A GSM modem is a wireless modem that works with a GSM wireless network. A wirelessmodem behaves like a dial-up modem. The main difference between them is that a dial-upmodem sends and receives data through a fixed telephone line while a wireless modem sends andreceives data through radio waves (Ashutosh, 2014). A GSM modem can be an external device or a PC Card / PCMCIA Card. Typically, an externalGSM modem is connected to a computer through a serial cable or a USB cable. A GSM modemin the form of a PC Card / PCMCIA Card is designed for use with a laptop computer. It shouldbe inserted into one of the PC

Card / PCMCIA Card slots of a laptop computer. Like a GSMmobile phone, a GSM modem requires a SIM card from a wireless carrier in order to operate(Ashutosh, 2014).

2.5 Subscriber Identity Module (SIM)

One of the key features of GSM is the Subscriber Identity Module (SIM), commonly known as aSIM card. The SIM is a detachable smart card containing the user's subscription information andphone book. This allows the user to retain his or her information after switching handsets.Alternatively, the user can also change operators while retaining the handset simply by changingthe SIM. Some operators will block this by allowing the phone to use only a single SIM, or onlya SIM issued by them; this practice is known as SIM locking, and is illegal in some countries.

2.6 Reviewed of Related Works

Global Positioning System is mostly used for tracking system. In this project we have studied various tracking system.

The monitoring system of a vehicle is the integration of tracking system(Benjamin Coifman, David Beymer, et al. 1998). Proposed a real time computer vision system for vehicle tracking and traffic surveillance on the basis of video image processing system. The vehicle trajectory is used as input to sophisticated, automated

surveillance applications. The tracking system can give exact position of vehicle and vehicle movements in weaving sections.

(Akande Noah Oluwatobi. 1999) represent automatic vehicle location is advanced method to track and monitor any vehicle equipped with software unit that receives and transfers signal through GPS satellite. Automatic vehicle location system used web based, mobile communication and SMS based platform for communication. This system enables to collect and analyze the information about location of vehicle in real time

Song *et al.* (2005), 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.

CHAPTER THREE

3.1 System Study

We went through literature on tracking system, and also, we visited the Nigeria Police Force Jattu, Uzairue. To investigate the way manual tracking is being carried out. We discovered that the way of tracking a vehicle without tracking device is stressful, time consuming and most times yield to no positive results. Problems such as car theft and kidnapping becomes very common (because most of the vehicle stolen are being used to commit crimes) and this makes the society to be unsafe.

3.2 Analysis of the System

3.3 Manual Car Tracking Procedure

3.3.1 Visit the Nearest Police Station

With a written statement describing the event of crime and details about the stolen car e.gVIN (vehicle identification number), color and name of car then obtain a crime reporting form from the relevant department, information such as applicant details, contact details and address information will be required.

3.3.2 Police Passes Signal Around

The police passes signal to all their unit using their means of communication by describing the crime information which the applicant state down.

3.3.3 Police Rely on Search Party

After send signals they will engage on stop and search on their major post they will also rely on other search party such as FRSC (Federal Road Safety Corps) and Immigration unit to help when they carry out their operation/duty.

3.3.4 Individual Search Party

Information will be passed around concerning the car to individuals by either the owner or the police, this would help recover the car.

3.4 Limitation of Manual Car Tracking

1. It takes time to track a stolen car.
2. Waste of funds.
3. Yield to no result most times.

3.5 Automated Tracking Device

1. Install a GPS tracking device in each vehicle or asset you want to track.
2. Signals are transmitted from the satellite to the receiver.

3. The receiver calculates the distance between itself and the satellites in real time.
4. A report is created showing your vehicle's travel distance or movement, coordinates and speed.
5. The data is transmitted to the GPS server using a wireless or cellular network.
6. GPS servers allow end-users to access reports in real-time from their computer, smartphone or tablet.
7. End-users can set up automated alerts for the information that is most relevant to their needs.

3.6 Design of the Propose System

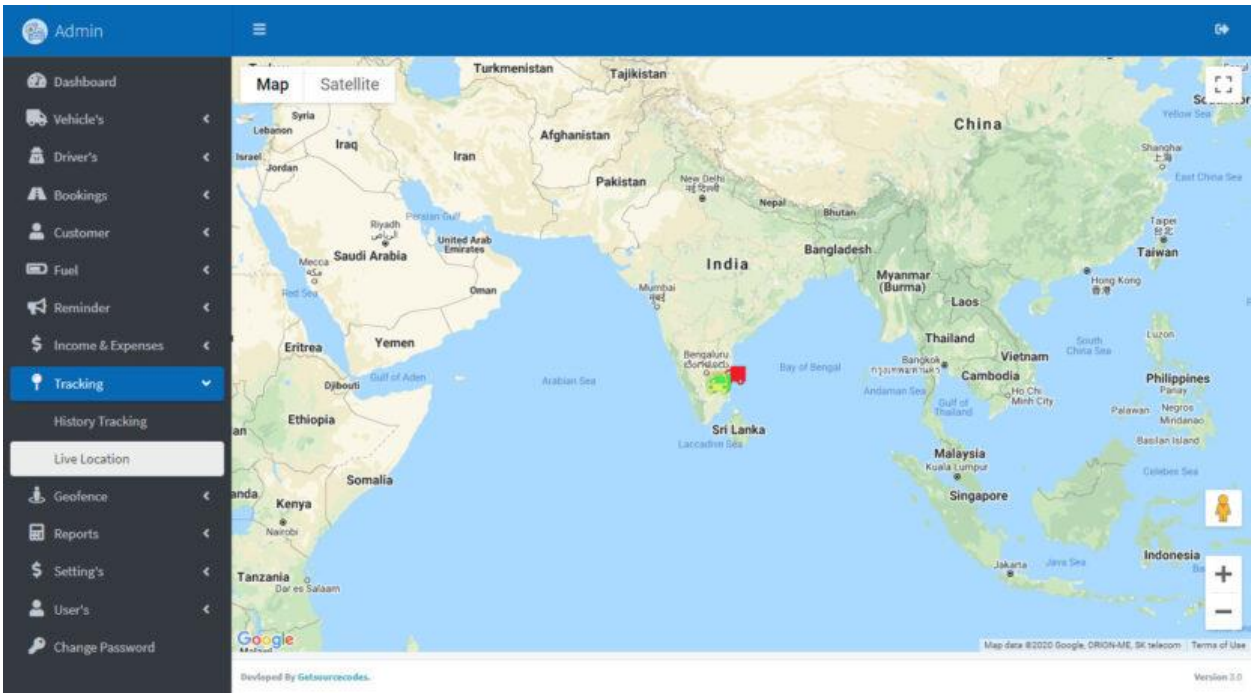
The proposed design for the tracking system will requires the following

1. The GPS Tracking Device
2. The GPS Tracking Server
3. The GPS User Interface

The GPS Tracking Device: The GPS tracking device is fitted into a vehicle by a professionally trained GPS Tracking System engineer this enables the GPS location of the vehicle to be tracked and monitored at regular intervals through a server.

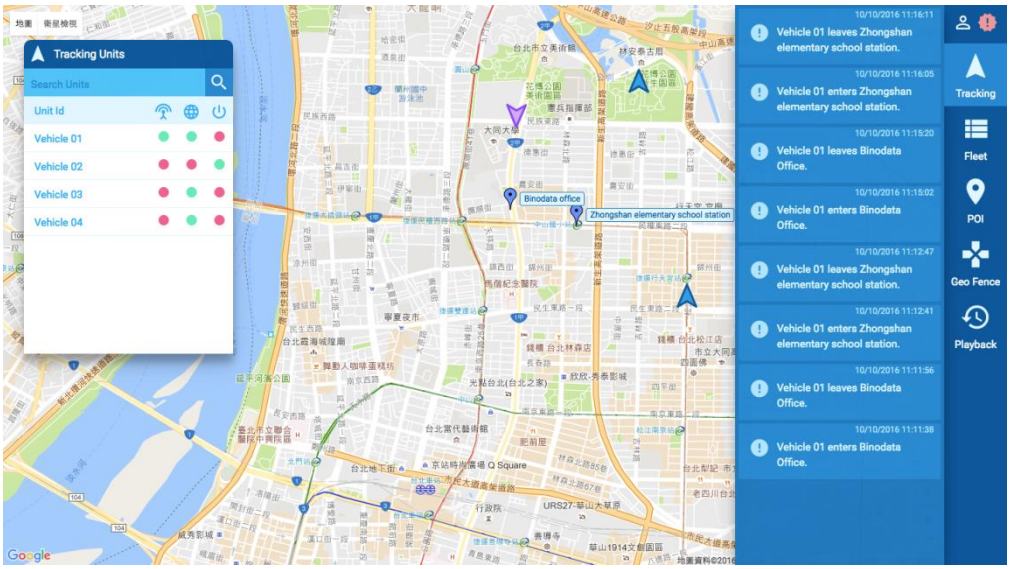
GPS Tracking Device

The GPS Tracking Server: The GPS tracking server performs the function of obtaining and receiving data from the GPS tracking unit, securing and storing that data and providing that information to the user when processed. The server is just a storehouse of the GPS Tracking System.

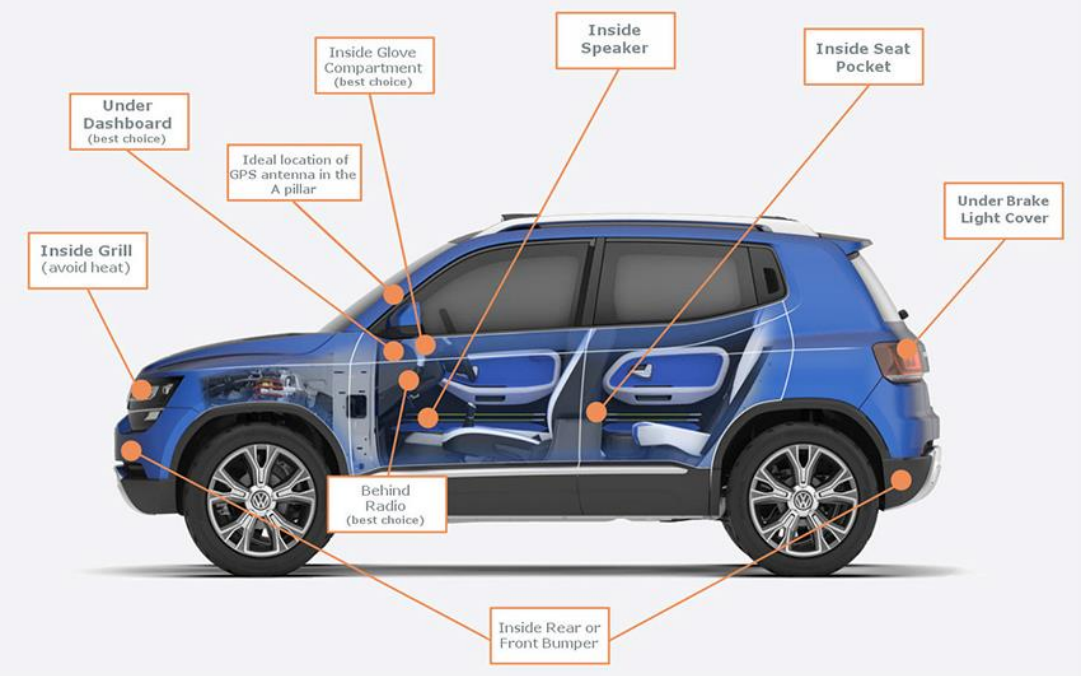


GPS Tracking Server (https://www.campcodes.com/wp-content/uploads)

The GPS User Interface: This UI determines how one will be able to access information, view vehicle data, and elicit important details from it either by phone or computer.



GPS tracking web user interface (https://camo.githubusercontent.com/gps)



Hard wired install (https://www.safewise.com/app/uploads)

CHAPTER FOUR

IMPLEMENTATION AND TESTING

This chapter describes and shows how this standalone system is implemented, developed and tested, using the appropriate necessary programming languages, tools and technology.

4.1 IMPLEMENTATION

System or Software Implementation is the conversion of the System Requirements into an executable and working system.

4.1.1 Implementation Choices

The Tracking Device works as web-based and online application system. It can be implemented using SDK, API, C#, Visual Studio, Android Studio and Google Map.

4.1.1.1 API

API stands for Application Programming Interface. In the context of APIs, the word Application refers to any software with a distinct function. Interface can be thought of as a contract of service between two applications. This contract defines how the two communicate with each other using requests and responses.

4.1.1.2 SDK

A Software Development Kit (SDK) is a set of software tools and programs provided by hardware and software vendors that developers can use to build applications for specific platforms. SDKs help developers easily integrate their apps with a vendor's services.

4.1.1.4 C#

C# (pronounced "See Sharp") is a modern, object-oriented, component-oriented and type-safe programming language. C# enables developers to build many types of secure and robust applications that run in .NET. C# has its roots in the C family of languages and will be immediately familiar to C, C++, Java, and JavaScript programmers. C# provides language constructs to directly support these concepts, making C# a natural language in which to create and use software components. Several C# features help create robust and durable applications.

4.1.1.5 Visual Studio

Visual Studio is a complete set of development tool for windows application, web applications and mobile applications. Visual Basic, Visual C#, Visual C++, Visual F# and many other languages are supported in Visual Studio. Programmers or developers like to develop software using visual studio. It is very user friendly.

4.1.1.6 Android Studio

Android Studio provides a unified environment where you can build apps for Android phones, tablets, Android Wear, Android TV, and Android Auto. Structured code modules allow you to divide your project into units of functionality that you can independently build, test, and debug.

4.1.1.7 Google Maps

Google Maps is a web service that provides detailed information about geographical regions and sites worldwide. In addition to conventional road maps, Google Maps offers aerial and satellite views of many locations. In some cities, Google Maps offers street views comprising photographs taken from vehicles.

4.2 System Requirements

The system requirements are the software and hardware requirements. The software requires a set of instructions that controls a computer's action. It is a computer program that accomplishes some specific applications or tasks. This software can be purchased or a user can develop the software from software developers.

The hardware requirements unlike the software refer to the physical components of the computer i.e. the peripherals in this design. The hardware and software requirements for this system are listed below.

Software Requirements

- Operating System — Windows 2007/2010/later versions\
- Browser — Chrome
- Web/Application Server — XAMPP
- IDE — Visual Studio 2017, Android Studio

Hardware Requirements

- Computer — Desktop/laptop
- Mobile phone — Android/IOS
- Intel Core i3 and above — 1.6 GHZ or above
- RAM Capacity — 4GB or above
- Hard Disk — 120GB or above
- Tracking Device — Self Installed Vehicle Tracking Device
- Car — Toyota, Mercedes Benz, Lexus, Honda.

4.3 SAMPLE INTERFACES

4.3.1 Installation of Tracking Device

Where to insert it: The tracking device can be plug in and hidden in this areas in a car glove box, directly engine, door storage of the vehicle, center console and under dashboard.

How to track: Login to your GPS provider online either by computer or smart phone and inputting the correct login details.

Dashboard: The window that allows user to

- Vehicle Information
- Tracking
- History Tracking
- Live Location
- Geofence
- Reports
- Settings

Vehicle Information: The window shows the information of the car being tracked.

Tracking: The window enables the user to track its vehicle by using the tracking interface.

History Tracking: This window allows users to view its vehicle history.

Live Location: this enables the user to view the live location of the vehicle by using google map.

Geofence: Enables the user to view the vehicle limit in some region of area and if the vehicle goes beyond the boundary of that region.

Report: This enables the user to generate both old and recent tracking reports.

Settings: This enables the user to change the settings on the web and application interface.

4.4 Configuration of AGPTEK GPS Tracker.

4.4.1 Platform Login Instructions

1. Login on the computer

Please input website w.008gps.com on the computer, and after entering the login interface. Select one country's national flag whose language is your desired. If there is no any flag suitable for the language you desired. You can choose the Union Flag which means you choose English.

Using ID No. of single tracker to login is as follow.

Using account to login is as follow.

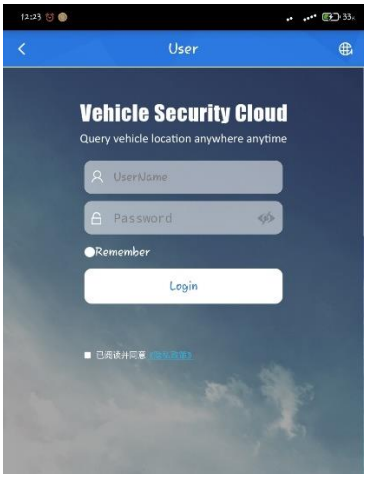
2. Mobile phone APP login

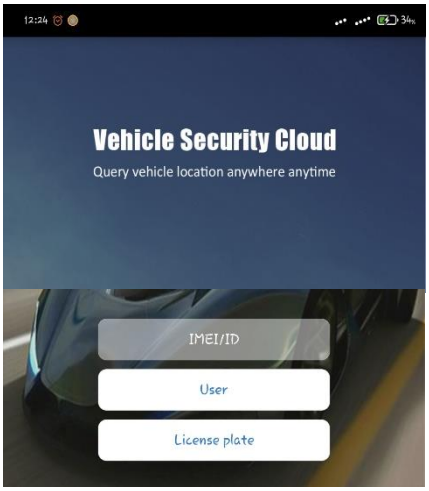
   Download App on the mobile phone

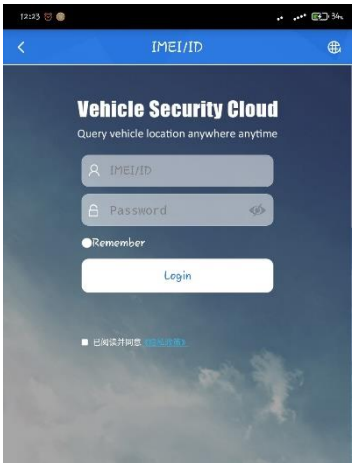
   Scan following QR Code to download and install APP

Choose ID No. or account to login

Single tracker Main interface Dealer







CHAPTER FIVE

CONCLUSION AND RECOMMENDATION

5.1 Conclusion

Vehicle tracking system makes better fleet management and which in turn brings large profits. Better scheduling or route planning can enable you handle larger jobs loads within a particular time. Vehicle tracking both in case of personal as well as business purpose improves safety and security, communication medium, performance monitoring and increases productivity. So in the coming year, it is going to play a major role in our day-to-day living.Vehicle's tracking get much attention from industry and researchers in recent years.

5.2 Recommendation

This research has not reach it peak point, better technology could still be applied by writing codes that is capable of adding more features. We employ every car owner to have a tracking device attach to their car for security and safety purpose.

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