

A Model of Android - Dependent Vehicle Monitoring System

F.O Aghware^{1*}, D.V Ojie², B.O Malasowe¹

¹Department of Computer Science
Faculty of Computing
University of Delta,
Agbor, Delta State,
Nigeria.

²Department of Software Engineering
Faculty of Computing
University of Delta,
Agbor, Delta State,
Nigeria

Email: fidelis.aghware@unidel.edu.ng

Abstract

From a global perspective, the number of cars using our roads around-the-clock has increased dramatically, and this has tremendously amplified the insecurity on our roads. This has become a key subject, especially in Nigeria. Consequently, automobile trailing schemes are gradually becoming evident amongst common users in the transport sector in most major metropolises. This paper aims to showcase a developed Android-based application system for vehicle trailing schemes that integrates Google Maps real-time features, the "Global Positioning System (GPS), and employs the Global System for Mobile Communication (GSM)" technology. The GPS component is a space-based navigation system that runs on location and time data at all times, irrespective of place and time on the globe, provided there is a line of sight to any of the four or more GPS satellites. The time and location are displayed, utilising Google Maps, which serves as an interface with the application so that the user will be able to constantly monitor moving vehicles via the smartphone. Presented here are the designed model and the experimental outcome of the automobile trailing system that verifies the possibility of the system trailing the movement of vehicles from one location to another at any given time, as well as an interactive Graphical User Interface (GUI) for the Smartphone application.

Keywords: Android Application, Global Positioning System, GSM, SmartPhone, Vehicle Monitoring

INTRODUCTION

In research conducted by (Montaser et al. 2012), they discovered that in recent times, the security of public and private automobiles is a key concern. To guarantee safety while traveling on the road, GPS trailing devices are mounted in automobiles. The devices rely on the Worldwide for Mobile Communication System, which determines the site (Longitude and Latitude) of the automobile to the smartphone from a remote location (Khondker, et al. 2009).

Also, (Eddie, 2013) in peculiar research, revealed that a trailing device provides the vehicle users, using the site data of an automobile within a specific path, but no map was used to get

*Author for Correspondence

a real location on earth. Many researchers have worked to develop automated vehicle trailing systems with the intent to trail and display the settings of a vehicle in such a way that the feedback to the devices follows immediately after the input is sent and with insignificant delay. The system's drawback, however, is that the operational costs of these trailing devices are frequently quite costly, which hinders worldwide adoption and prevents wider use of the resulting technology. The deployment of earlier real-time monitoring devices and inexpensive implementation costs have not often been covered in the literature. The alternative deployment of smartphones, which (Junaid et al., 2009) viewed to be a more cost-effective replacement, has been prompted by development.

The modelled Android-based system for vehicle trailing is made up of two parts - the client part and server part architecture. The model being discussed contains the application which encompasses a Google map interface, a Camera for capturing the internal mechanisms of the vehicle, SOS, and a Speed sensor. The research conducted by (Ramani *et al.* 2013), revealed that the information can also be displayed on the user's smart device. Google map shows the location details on the smartphone in real-time as specified in the application. When a transport corporation uses the programme, the architecture is such that the head office of the transport company may request real-time vehicle information from the vehicle system, such as speed, position, and projected time of arrival. In research steered by (SeokJu et al., 2014), a set of instructions were packaged and embedded in the system to read the process and scrutinise the data once it was learned that the system's data is kept in reserve. With the use of virtual mapping software, a great deal of information may be gathered and then observed, including geographic coordinates, speed, distance, etc. It was discovered that the system's data is held in reserve and a software package can be established to read the process and scrutinise the data. Quite a lot of factors like topographical coordinates, swiftness, distance, etc. can be acquired and then observed using digital mapping software. In another vein, (Parvez *et al.* 2010), opined that private automobile vendors would use Smartphone application devices to communicate with the system, the system uses GSM and GPS technologies in providing the anticipated facilities.

This paper's major goal is to provide a trailing system that has been created utilising cutting-edge technology and to make it accessible to regular car owners in our society. We have talked about a real-time Android application system utilised for car trailing using a low cost Smartphone shield mounted to a moving vehicle, allowing the owner or user to keep track of the vehicle's whereabouts. The GPS receiver will continuously supply information to show the vehicle's location in real-time, including its latitude and longitude.

METHODOLOGY

The Android-Based Trailing System

The client-server architecture

In the work of Mohan et al. (2018), it was discovered that the Universal Locating Scheme is a Global Navigation System (GNSS). It obtains signals from at least three satellites to compute its dual-dimensional (latitude and longitude) position. GPS is a key technology for getting a position. Its disposal in car trailing systems is employed to provide users with the coordinates of a location anywhere on earth. In the work of Mohan et al. (2018), they discovered that the Universal Locating Scheme is a Global Navigation System (GNSS). It obtains signals from at least three satellites to compute its dual-dimensional (latitude and longitude) position. GPS is a critical technology for determining one's location. Its disposal in car trailing systems is employed to provide users with the coordinates of a location anywhere on earth. The fleet

data is stored on the dedicated server of the vehicle authority and the fetched data is sent back to the user. The GSM/GPRS component is in charge of synchronizing a trailing system and a remote user so that vehicle position data may be sent to the GSM/GPRS network through a TCP/IP connection.

The Software Specification

The Android Mobile SmartPhone

This is an advanced type of mobile phone which was developed for different mobile networks and is capable of running different applications, but it depends on the precise task assigned. In the discussions in this paper, the smartphone is mainly used for receiving an alert from a specific user. Every Android mobile Smartphone contains is fitted with GPS, which is used to establish the current location of the car from which the signals are being transmitted consequently, enabling the trailing process. The Android application and the smartphone, which were both constructed using Google's open source database system servers as drivers, are granted security permission in this application via the Universal Locating System.

The system for the Android software development tool (SDK)

The design of an Android application is supported by a software development tool, which also functions as an API (application programming interface). Its responsibility is to oversee and offer exceptional functionality to make it simple to install API modules in accordance with different Android OS versions. The SDK's assistance for designers using the Android emulator is yet another crucial use. As a result, the programmers may test their code's operation on a variety of emulated handsets with various specs.

The Android software stack or Android design is separated into the following classifications.

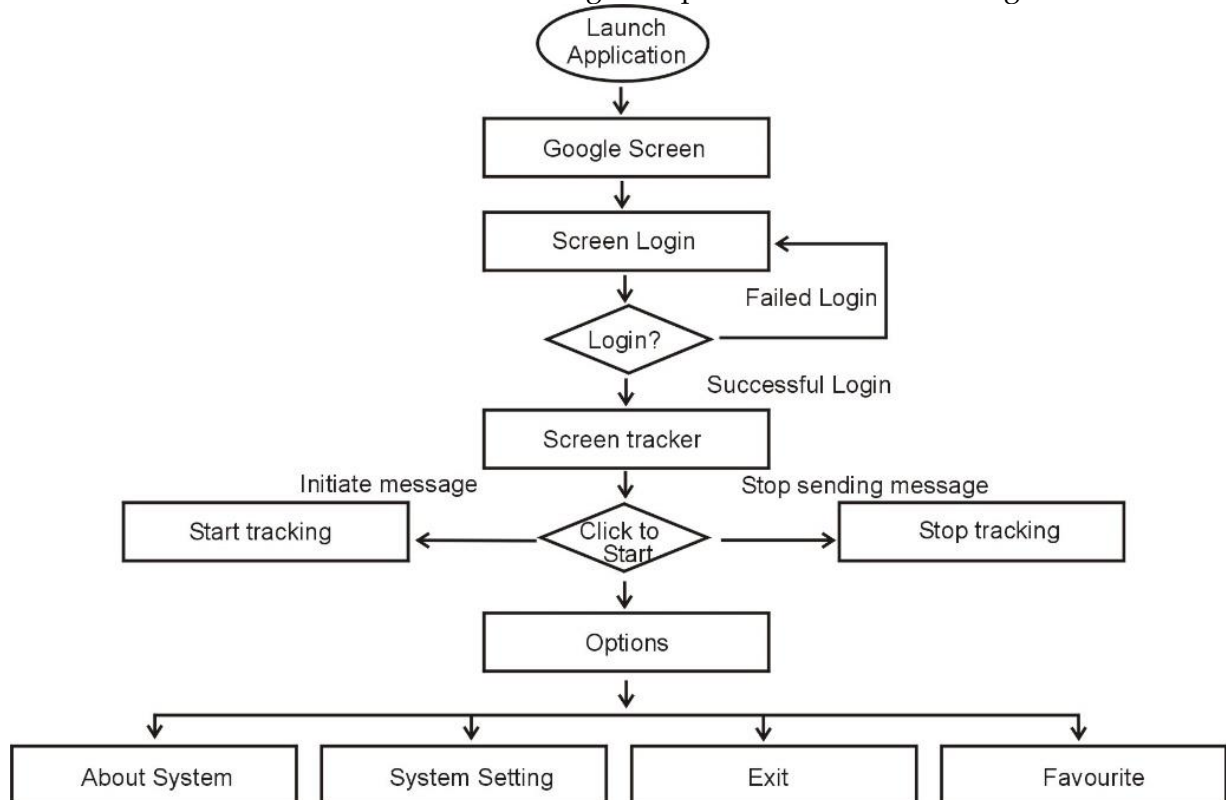


Figure 1: Application workflow diagram

As shown in the Application workflow diagram above, the system can be launched using the application user interface and navigating the different interfaces to launch the application.

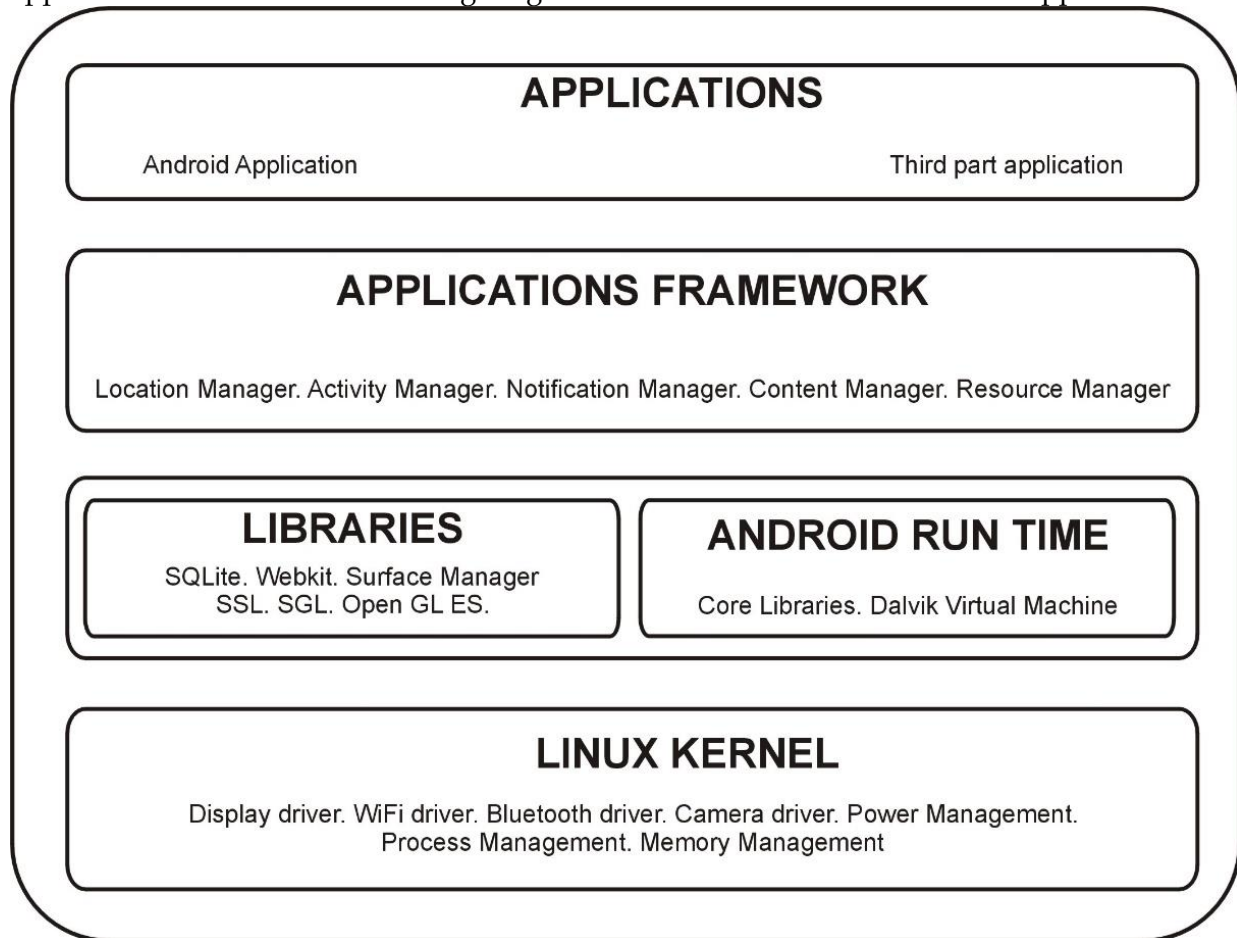


Figure 2: The Android Architecture

The architecture consists of three phases; they are as follows: Native libraries, the Linux kernel, and the application framework

Linux kernel

The Linux kernel, which serves as the basis for the architecture used by Android, serves as the foundation for the selected architecture. The Linux kernel is in charge of managing device management, power control, accessing system resources, and managing device drivers, in addition to managing memory.

Application Framework

The top layer of the Android runtime and libraries is the Android framework. It comprises the Android APIs, which contain the telephony, UI, allocation of resources, management of packages, providing content, and location information. The application framework provides the Android application development environment and provides several interfaces and classes.

Native Libraries

The Linux kernel consists of libraries, which are as follows: SQLite, FreeType, WebKit, Media, OpenGL, C runtime library, etc. This schedule controls the database, Webkit is responsible for the browser support, the media helps in playing and recording audio and video formats, and also for Free Type font support.

The Android Runtime

The android runtime consists of DVM (Dalvik Virtual Machine), which controls and runs the android application and main libraries. The Dalvik VM use the Linux main features for similar memory organization and multi-thread, they are embedded in the Java language. The Dalvik VM allows android applications to run on their process and performance, and also on the case of Dalvik virtual machine.

RESULTS

Flowchart diagram of the proposed model.

The system workflow is illustrated in figures 1 and 2 above. The system was developed based on the client-server application, the traveller (driver) acts as a client and while the automobile that has the GPS installed acts as the server system. Dual applications are designed, one acts as the client application, while the other acts as the server application. The traveller (driver) uses the client application, which is installed on their smartphone, and the server application with GPS installed on it is used by the vehicle.

The Android-based application is to track vehicles, which is achieved in three phases, as described below:

Firstly, to Acquire the geographic directions of the vehicle in actual time utilizing the GPS receiver. Secondly, by transmitting the vehicle location information through the GSM component. Thirdly, it shows the location and name on the Google map in real-time via a smartphone.

CONCLUSION

The goal of this system is to have a dependable transportation system in an urban environment, which provides travellers with the real-time location of the vehicle. This system will also help to know the estimated arrival and departure times of the vehicle and how farther the vehicle is from the travellers. This could help the travellers to know if they can wait or leave. This system simply assists in trailing automobile and state the time of arrival and the distance of the automobile from the traveller. When there is a positive link created between a traveler and the systems server, the server then sends its coordinates location to the client systems. The moment the GPS directions are accessible, they are further sent to the client systems by the server system else the nearby GSM location network coordinates are sent.

This system helps provides enhanced service and an effective solution to users at a reduced cost. The system ensures the security and safety of automobiles, the drivers, and passengers and is better equipped using cameras to acquire the real-time assessment of the automobile, it would be more suitable for the operator to track the automobile. This system could be made friendly through SMS in the future. A Signal system could also be added to alert the stealing of automobiles. The distance to be traveled could be calculated and documented through a databank.

REFERENCES

- Eddie C.W.L. (2013). Simple Bus Trailing System. *Journal of Advanced Computer Science and Technology Research*, 3(1).
- Junaid, A, Shahid, N, Taha, A, and Naaveed, A, (2009). 'Implementation of GSM-based Commercial Automobile Tracker Using PIC 18F452 and Development of Google Earth Embedded Monitoring Software' Proceedings of 2009 IEEE student conference on

- research and development (SCORED 2009), Nov. 2009, Malaysia. DOI:10.1109/SCORED.2009.5443760
- Khondker, S.H, Mashiur R, Abul L, H, M Abdur, R, Tanzil, R, and Rasheed, M. M., (2009). 'Cost Effective. GPS-GPRS Based Object Trailing System', Proceedings of the International MultiConference of Engineers and Computer Scientists 2009 Vol I IMECS 2009, March 18 - 20, 2009, Hong Kong
- Montaser, N.R, Mohammad A.A, and Sharaf A.A, (2012). 'Intelligent Anti-Theft and Trailing System for Automobiles. *International Journal of Machine Learning and Computing*, 2(1).
- Mohan, C.R.K, Sharukh Khan M.A, Khan, P.N, and Nayana D.K, (2018). 'Real-Time Android-Based Vehicle Trailing System Using Google Maps. School of Electronics & Communication Engineering REVA University, Bangalore. *International Journal of Advanced Research in Science and Engineering*, Vol. 7(7), pp. 658-667
- Parvez, M. Z., Ahmed, K. Z., Mahfuz, Q. R, and Rahman, M. S, (2010). 'A theoretical model of GSM network-based vehicle trailing system'. International Conference on Electrical and Computer Engineering (ICECE), pp. 594-597.
- Ramani, R, Valarmathy, S, Suthanthira N, Selvaraju, S, Thiruppathi, M, and Thangam, R, (2013) 'Vehicle Trailing and Locking System Based on GSM and GPS,' *Int. Journal Intelligent Systems and Applications*, vol. 9, pp. 86-93.
- SeokJu, L, Girma T, and Jaerock K. (2014). 'Design and implementation of a vehicle trailing system using GPS/GSM/GPRS technology and smartphone application,' 2014 IEEE World Forum on Internet of Things (WFIoT).