

## INTRODUCTION

### 1.1 Background of Study.

The rate at which automobile theft incidence occur is increasing now days at an alarming rate all over the world. Although Stealing of vehicles is not the only way automobile theft can take place, most times vehicles are being vandalized. For instance, parked car battery theft these days is so rampant everywhere. Burgling a parked vehicle to steal some important things kept inside the car is also another common way of automobile theft. Monitoring of vehicles is the primary concern of every vehicle owner (Vineth, Kumar, & Shibi, 2019) and as such every vehicle owner would not mind going to any length to ensure his/her vehicle remains secure. Therefore, security of these vehicles has always been a concern to car owners. Hence, the need for the proposed system: **Android based Vehicle Monitoring and Control System (AVMC)**. In this system, a user can control his/her vehicle using an android based smart phone. An integrate technology is the latest trend to solving problems in the field of informaion and communication technology. To be able to design a product using an integrated technology will be beneficial to any electrical and electromechanical problems and a huge contribution to the digitalization of the world (Rajeevan, Payagala, & Malabe, 2016).

Therefore, the design and implementation of the proposed system; Vehicle Monitoring and Control System (AVMC) is based on combination of different technologies that functions together as a unit. These technologies include; GPS, GSM module, Microcontroller, wireess sensors and software based android application. Through this, a secured module of communication between a smart phone and the vehicle is established via GSM network. Using his/her smart phone, users will be able to; lock/unlock the vehicle by disabling all the functional electrical circuit and enable them at will, sense when any part of the vehicle (example; car burnet) is opened and as such trigger an alert to the owner via GSM module. In a situation where GSM network is momentarily unavailable, a secured Bluetooth channel will be used instead for information transmission.

The proposed system consists of sensor actuator module and GSM communication module to acquire the input signals & control and through GPS and an android based mobile phone transmit the signal to the user.

## **1.2 Motivation of the Study**

The need to curb the menace of vehicle vandals and theft in our society by unscrupulous element especially incidence of car battery theft, stealing of vehicles or items kept in a car through the use of master keys is of great importance. Cars parked even at the comfort zone of the owner's residential home are being stolen or vandalized in the night when everyone is fast asleep, not only during night hours, there are situations in day time where a car owner will park his car and before checking on it later, the car could either disappear or may no longer start because the car battery is gone. A Vehicle tracking system combines the use of GSM Module and automatic vehicle location in individual vehicles with GPS Module and software that collects information regarding the location of the vehicle(Vineth et al., 2019). Modern vehicle tracking systems commonly use GPS or GLONASS technology for locating the vehicle, but other types of automatic vehicle location technology can also be used(Ruby, Abinashrajasingh, Ganeshprasad, & Ej, 2018). Vehicle information can be viewed on electronic maps via the Internet or specialized software(Darekar, Chikane, Diwate, Deshmukh, & Shinde, 2012). Urban public transit authorities are an increasingly common user of vehicle tracking systems, particularly in large cities. The system transmits the live location of the particular Commercial vehicles, also the system is programmed in the way that tracks the vehicle continuously and a message is sent to the owner regarding the information about the location of the vehicle(Borade, 2013).

My motivation however, is how to checkmate car battery theft through the use of integrated technology to design a vehicle security system and interface the monitoring by the owner's mobile phone, which I strongly belief will be the absolute solution for curbing the current situation.

### **1.3 Statement of the problems**

Every year, thousands of vehicles are stolen in the roads and unsecured car parks. Sometimes, thieves try to steal the vehicle parts by opening doors or breaking glass. Because of this people are afraid to park their vehicles on the road or unknown car parks(Vineth et al., 2019). How to avoid this problem has introduced many designs and techniques which have been designed and implemented in vehicles. Vehicle tracking, monitoring and alerting system is a challenging problem.(Dukare, 2015), there are many challenges in vehicle monitoring due to deficiency in proper real time location and proper alerting system(Ruby et al., 2018), however, the major challenge is that most of the vehicle monitoring system in existence were based on tracking the location of the vehicle rather than monitoring the current and present situation of the vehicle(Arunthavanathan, 2017). Also, GPS (Global Positioning System) which is the most widely used technology for vehicle tracking, and keeps regular monitoring of vehicle main objective is to manage and control a vehicle using GPS trans-receiver to know the current location of vehicle. In number of system, RFID (Radio Frequency Identification) is chosen as one of technology implemented for monitoring vehicle location(Dukare, 2015), but they do not checkmate the situation of the vehicle to know if any part of the vehicle is open or damaged.

### **1.4 Aim and objectives of the study**

The aim of this dissertation is to build an enhance Android Based Vehicle Monitoring and Control System with the following objectives:

- i. To investigate existing Vehicle monitoring and control system algorithms to achieve effective vehicle monitoring task
- ii. To build an automatic vehicle location technology with an alert system that sends sms alert to the owner whenever the vehicle burnet, door or car boot is opened.

- iii. To propose an enhanced methodology for building a more effective car monitoring and control system that checkmates the present situation of the vehicle rather than just tracking its location.
- iv. To build an android based application that can disable the electrical circuits of a car.
- v. To implement the system for more accurate security watch on vehicles

## **1.5 Significance of the study**

The significance of this study would be to design an enhanced and a more effective vehicle monitoring and control system which does more than monitoring the location of vehicles only. The system is programmed to carry out real time tracking of vehicles and monitors the present condition of vehicle against any intrusion and help scare away vandals. Hence, the system will take proper monitoring and control of the following;

1. Real time tracking of vehicle location while in motion.
2. Real time monitoring of the present condition of vehicle while not in motion, that is to say when the vehicle is parked in an unsecured location or car parks.
3. Checkmate car battery theft by alerting the vehicle owner through sms in case someone gained unauthorized access into the interior parts of the car, or opened the car burnet.
4. Vehicle control function which through the android application can disable all the electrical circuit functionality in the car.

## CHAPTER TWO

### LITERATURE REVIEW

Vehicle monitoring is a system that can be used to determine the status of a vehicle at any given period of time and location. Apart from knowing the location, Vehicle can be monitored for the following reasons; security concerns, speed limit control, arrival time estimate, fuel consumption alert, and even battery charge level monitoring. Controlling of vehicle involves remote control of some of the functionalities being carried out by the owner/driver of a vehicle, such as; remotely and automatically controlling the car engine, automatic door lock/unlock control as well as other controls such door and temperature notification at anywhere by using mobile phone applications (Rajeevan et al., 2016). The ability to track, control and trace device has been mankind's unfulfilled desire(Lokhande, Gatkal, Lokhande, Bahir, & Shivale, n.d.). Therefore, vehicle monitoring is mainly carried out via vehicle tracking and the process can be either passive or real time tracking(Safdar, Zeb, Khan, & Kaleem, 2018).

Vehicle tracking system is a tracking device which is generally operated by GPS attached with the vehicle. The design system consists of Sensor- actuator module and communication module to acquire the input signals and control the vehicle functions and monitor the vehicle by using GPS and Android mobile phones. A Vehicle- tracking technology is advantageous for tracking and monitoring both commercial and passenger vehicle. As concerned with personal vehicle tracking, it allows recovering our stolen vehicle by pin pointing that gives the exact location. Vehicle function is monitored by using sensor-actuator modules or GSM module. If any emergencies, the module will send an alert signal to the android application and alert the user, by using android application user can control the vehicle engine(Rajeevan et al., 2016).

In this era of mobile internet and smart phones, the smart phone based monitoring and controlling applications attract users due to high penetration of low cost android smart phones in the market. Since these mobile devices have become more powerful and distributive, mobile computing has become more important(Christian, 2018). The most popular mobile operating systems are Apple's iOS, Microsoft's Windows mobile and Google's Android(Okediran, Arulogun, & Oyeleye, 2006). Android provides API's to develop applications on android platform using Java programming

language. These smart phones have limited storage and battery life; therefore developers pay more attention to the efficiency of the program when they develop applications. Vehicle tracking systems based on Android based smart phones are suitable for developing countries like Nigeria as the number of smart phones users are increasing day by day(Safdar et al., 2018).

To track vehicle's location, various schemes have been proposed, which are as follows:

**A. Passive tracking and monitoring:** Initially vehicle tracking systems developed for fleet management were passive tracking system. In passive tracking system a hardware device installed in the vehicle store GPS location, speed, heading and a trigger event such as key on/off, door open/closed. When vehicle returns to a specific location, device is removed and data downloaded to computer(Kamble, 2012). The absence of real time alerting system made this type of tracking system inappropriate. Moreover, the system works best in commercial vehicles than private vehicles.

**B. Server based tracking system and monitoring:** in this vehicle tracking system, data collected from GPS receiver is sent to the web server via GPRS cellular network. When the users need to monitor their vehicles, a request is sent from an application to the web server, that will process these request and responds back to the requesting application. A user must send a message to a SIM- card inserted on GSM module. The user will get a reply from the module in terms of coordinates i.e., latitude and longitudes. The user clicks on received coordinates in order to view the location of a vehicle on google maps. The absence of user friendly application and since the application is server dependent; server failure will cause serious problems, hence, the drawback of this scheme is the usage of a central server which is a single point of failure. If the server stops working, the whole system will collapse. Moreover, if a single user is interested to track his vehicle, the usage of central server is termed as waste of resources(Safdar et al., 2018).

**C. Real Time Vehicle tracking and monitoring system:** unlike the passive tracking system whose record is to be downloaded before it can be interpreted, is a real time Android based Vehicle tracking system that is designed and could be installed on any vehicle to track its

position. The system provides GPS coordinates to a mobile phone where these coordinates are mapped on a google map with the help of an android based application. The graphical user interface (GUI) of the application is user friendly where users can easily track their vehicles. The cost of the system is relatively very low which makes it a perfect choice for the customers to install it in their vehicles to make them secure. This scheme though is a real time tracking system, the systems set back is that it lacks other source of alerting the vehicle owner since it only tracks vehicle location and does not do any other thing to enhance the security of the vehicle as only location tracking is no longer sufficient to secure vehicles in this 21<sup>st</sup> century.

**D. Vehicle tracking and fuel consumption monitoring System:** The vehicle monitoring system provides a real time and proper notification system about the fuel level in the fuel tank and to also track its location. The driver can make a false statement about the fuel level to the owner and can gain extra money. Such deceit is eliminated by the notification system. The system helps the owner to have the knowledge of fuel level in vehicle and the location of the vehicle at regular interval of time. It helps to know the honesty of the driver to the owner and also can save the money. This project vehicle monitoring system represents the notification to the mobile numbers. The vehicle monitoring system can track the fuel level in the vehicle and also the geographical information of the vehicle and sends the notification to the owner(Vineth et al., 2019). Though this scheme can be highly beneficial for the automotive industry, but it's inability to take into account of cases where vehicles are vandalized while not in motion is its set back as it lacks a means of alerting the owner when thieves try to steal the car as it only tracks its location. Moreover, sophisticated criminals may disable the tracking system before taking the vehicle away.

**E. Proposed System:** To address these problems, An Android based Vehicle Tracking System with the ability to monitor when any part of the vehicle is opened is developed. Once the vehicle part like car burnet is opened, an alarm is sent to the owner to alert him of the development. The main components of the system are:

1. Pic18f4431 microcontroller
2. SIM900A GSM Module
3. SKG13C GPS Module
4. Opto-Interrupter sensor
5. Relay
6. LCD.

An android application is developed to map the received vehicle's coordinates on a Google map. It is envisioned that the proposed system will be easily customizable for various applications. The proposed system can be used globally and is expected to be cheaper.

**CHAPTER THREE**  
**SYSTEM METHODOLOGY AND DESIGN**