GSM and GPS Based Mobile Vehicle Detecting System

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Abstract: - Tracking of moving vehicles is challenging, as safety cameras do not cover the wider area. Optimising the coverage area is essential in order to improve in detection process efficiency. There are many researchers working on the system with various techniques mainly with GPS and satellite system. This paper explains the design of combining Global Positioning System (GPS) and Global System for Mobile Communications (GSM) technologies (hybrid systems) to detect moving vehicle efficiently and accurately. We have used System Tool Kit (STK) to simulate the system and found that coverage with two technology is better than existing systems.

Key-Words: - GPS, GSM, STK, Vehicle tracking, satellite

1 Introduction

This paper explains locking and detection of vehicle if it is theft. Normally GPS technology has been used, but this paper explains both GPS and GSM technologies for the system. Tracking and positioning of the vehicle is already been known in the modern world. Normally GPS installed in vehicle detects the position of the vehicle.

Most of the vehicles are being stolen and/or damaged when they are parked in the shopping malls, train station and other parking area. Tracking of the stolen vehicles and its whereabouts are the problems which are required to be traced on time to avoid any damages, or monetary losses. A quicker and much accurate way of tracking the vehicles would lead to solve this stealing crime.

This paper explains vehicle tracking and positioning system that allows the owner to view status of their vehicle via their portable mobile device. GSM based system that works on the GSM technology can be used with GPS for the positioning of the vehicle. If the vehicle is stolen or lost the place can be identified by using the GPS and will send the message to the owner of the vehicle. The purpose is to design a system that will make an owner fearless of any robbery happened to the system and if the vehicle is theft this system will keep the owner updated about the vehicle which then can be recovered.

This system is specially designed for construction and transport businesses, because it gives real time information of vehicles to the owner. The system is designed to reduce the risk of stealing the vehicle, as this has been an issue for the safety and security of some expensive cars in the world. The information will be sent in the form of text message directly to a given mobile number which will essentially update the owner of the car. In case of a robbery, the information will be shared with the police so that they can take an action on the spot.

Section 2 gives related work, section 3 explains experimental design, and implementation is given in section 4. Lastly, section 5 concludes the advantage of our proposed system.

2. Literature survey

The system of a multi camera tracking system for recognising vehicle plate is explained in [1]. Real challenging task is to recognise the vehicle plate on the highway rather than on the toll or a parking area. In these places a camera will be normally be fixed to capture an image of a car plate. On highways although cameras are installed, they don't focus on the number plate of the vehicle, because of the different angle and directions of both cameras and vehicle. So this paper describes two methods to overcome this problem. Segmentation method, fast Fourier transform and histogram method are potential solutions to detect vehicle number plates.

An intelligent video system [2] work is carried out to assist the police action on certain events by getting real time in car video analysis. This allows the remote monitoring of vehicle from police station. This gives comprehensive approach of the targeted vehicle through videos from various environment and condition for further examination of suspects. This is equally effective in both day and night conditions, as the equipment installed has already been considered for these kinds of conditions.

Wireless embedded system paper [3] illustrates the communication embedded system to share vehicle identification with police to increase the chance of recovering a stolen vehicle. This communication system addresses the police about the theft vehicle in real time. The purpose of this system is to decrease the appearance of such activity of car theft. It is based on ad-hoc network

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between police cars and general cars that are within a particular range, a result of a car being stolen the information will be shared with nearby police officer in order for them to take severe action.

Tracking system [4] describes the procedure and modules that are involved in tracking multiple cars on the highway. These modules contain lane detection, 2D model-based trackers, heuristic car detection and a process coordinator. Installed modules are U and rectangular shaped. System was tested by image sequence from PETS2001 and the average processing time per frame is 12 ms.

GPRS system [5] is a microcontroller hardware based design and implementation. It contains microchip with a pic microcontroller 16f877A and fabricated PCB layout with prototype. This system has the ability to track the current position with specific time and date. It analyses the data from the GPS receiver. This also describes the computer programming that is involved in the pic microcontroller.

Tracking system with integrated GPS/GPRS module [6] paper explains a real time tracking system which illustrates the positioning and localization of vehicle with a minimal cost. GM862 cellular quad band module, monitoring server and a graphical user interface are used in this system. System is experimented and tested in different areas of kingdom of Bahrain via Google map. Currently investigation team is using this system.

Technology and hardware device specifications used in real time information of the vehicle is explained in [7]. Some of them use cellular transmitter that are coupled with the GPS technology. There are two major types of car tracking system as passive and active.

Passive system use simple vehicle tracking devices that work with GPS to record the information of vehicles and to transmit this data to computer or any storage device to analyse. Active system use real time information of the vehicle and transmit the data in real time.

GPS technology [8] gives the information of the positioning of the object such as vehicle, person or device. Now-a-days GPS technology is installed in every mobile phone. GPS works through satellite information. This system is funded and controlled by the US department of defence. Initially it was designed for the operation of military army, but currently available to everyone. These devices use global navigation satellite system that are linked via microwave signals to transmit to the GPS devices. Signals are used to gather information about the location, vehicle speed, time and direction. The receiver process these signals to track the exact location, compute velocity and time. Some of the devices use 3D and 2D features to view street, address and exact location. This GPS technology is very helpful in positioning the vehicle or finding address or location.

Paper [10] explains the routing and tracking of vehicle or any mobile devices in a large area basically in an outdoor environment, which comprises a hybrid GPS (Global positioning system) and GSM (Global system for mobile communication) technologies. GPS module-EMD3620 of AT&S Company and GSM modem-GM862 of Telit Company are hardware used in this system. It also contains 32 bit microcontroller that controls hardware devices.

3. Vehicle tracking system design

This paper explains GSM and GPS based tracking system to track the positioning of the vehicle. It is an efficient system that integrates both GSM and GPS technologies. This system also contains a micro controller. It will be used for the activation of all the devices attached to it. The GPS is installed in system to give the updates of system. Once vehicle is stolen, message will be sent to owner. Vehicle owner or police can follow through the signal emitted by the GPS and the stolen vehicle can be tracked.

One more feature is added in the system in parallel to detecting process, the vehicle engine will be turned off remotely and the robber will not be able to take this vehicle far away. Password set by owner of vehicle needs to be entered to start the vehicle.

3.1 Proposed system

Proposed tracking system depends on the GPS and GSM signals. There will be a password given to the user for the restart and activation of the engine. To authorize the car although there is an option of resetting the password if the user seems to be unsafe with the given password. There will be a time limit frame for the customer in link with the central system. System Tool Kit (STK) is used to demonstrate the proposed system with the traffic, vehicle and satellite coverage.

3.1.1 Assumptions

System is tested and debugged on the STK where positions and criteria for the vehicle are assumed. Frequency of the system, available signals of the equipment and network have been taken as constants.

3.1.2 Technical design

Microcontroller based system in which all devices will be controlled by the microcontroller while the communication is GSM based, and positioning will be done through GPS. It is a complex activity system. Software tools and software-hardware tools can be used for this system. Software tools monitors and simulates, independent of the hardware. Software-hardware tools are usually hardware dependent, more expensive and range from in-circuit emulators and in-circuit simulators to in-circuit debuggers. The user program operated in a simulated environment where the user can insert breakpoints within the code to stop the code and then analyze the internal registers and memory, display and change the values of program variables and so on. Incorrect logic or errors in computations can analyze by stepping through the code in simulation. Proposed system with the traffic load is simulated on STK and step by step.

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3.1.3 STK (System Tool Kit)

STK [10] is a simulator in which we can view and simulates different traffic in the particular area and access to the satellite and sim based communication.

When the STK starts, the window as shown in Fig. 1 opens up and here we can view the scenario in 2D as well as 3D. There is one more window appearing in the picture from where we can insert different objects. This also has the option of the video so that we can design and view. It shows the result with respect to both orbital and spin motion of the world and satellite.

4. Simulation and experimental results

The general scenario for the vehicle detection system is created for Australian environment. Main headquarter and all sites are linked. Main office gathers information of vehicles of all Australian cities as shown in Fig. 2.

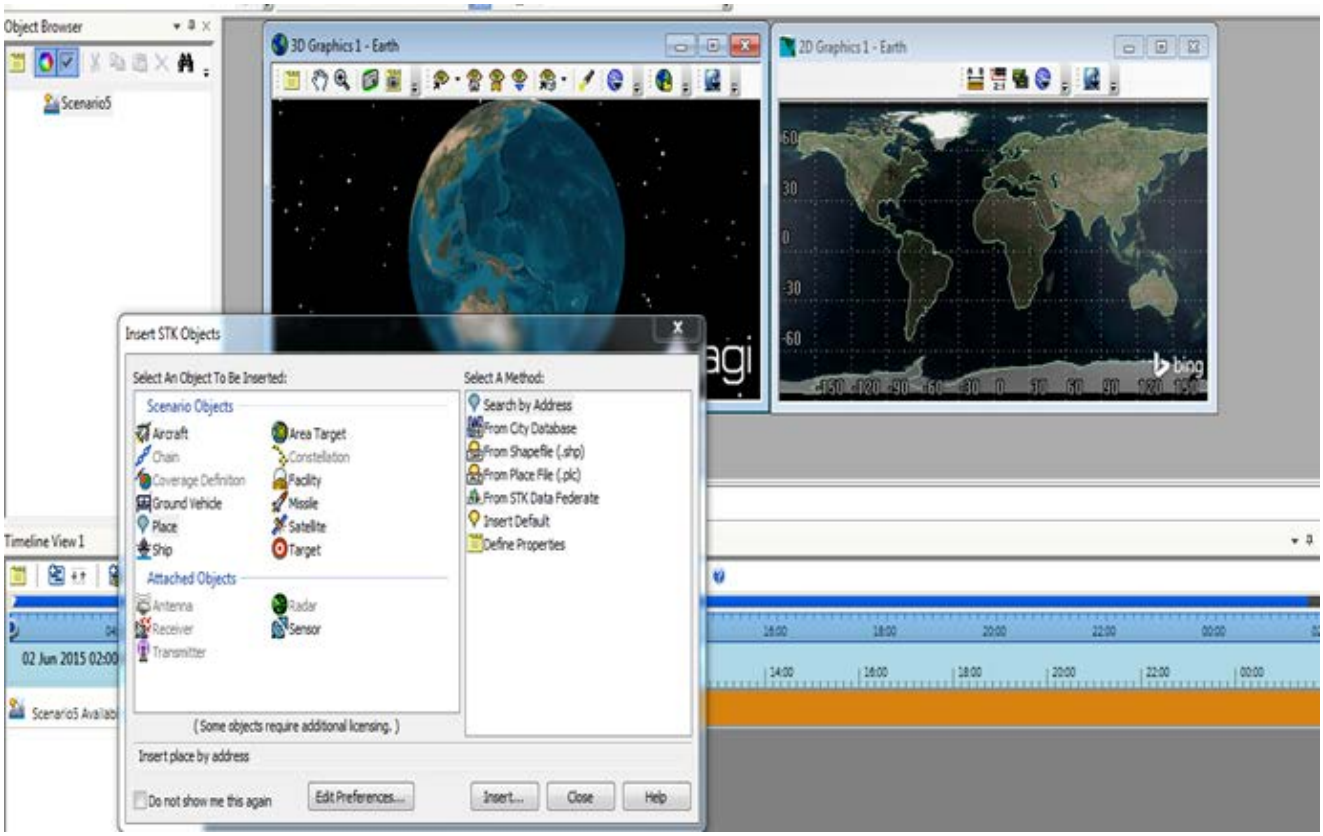

Fig. 1: STK

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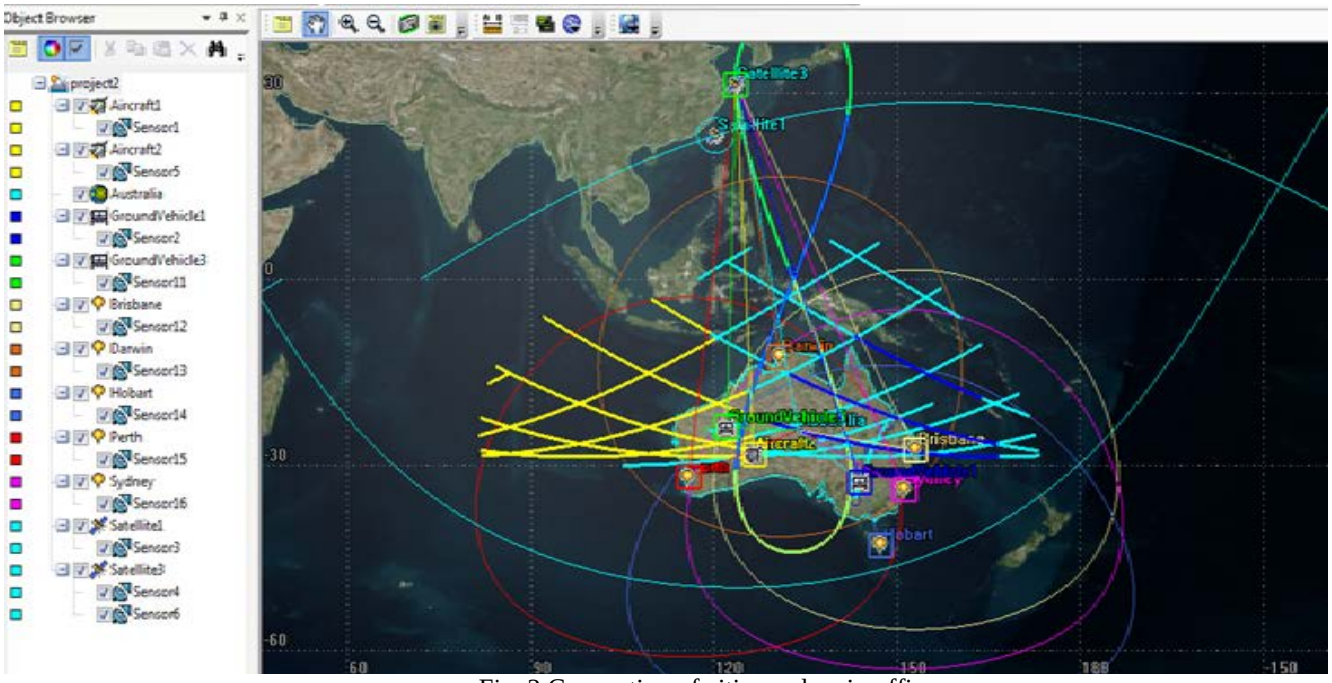

Fig. 2 Connection of cities and main office

Lines in Fig. 2 and 3 indicate signals to link with other cities. Cities are connected to the main office as well as the satellite. The information of the vehicle is stored from the ground site in main office. The Fig. 4 shows the process and simulation of the network scenario in between the city, satellite and the main head office.

4.1 Access between cities and Australia

The access report of the particular city with the main office shows the duration of the uplink. In Fig. 3, the network is established between Hobart, Perth, Sydney, Melbourne and Brisbane. They all are connected with the main head office.

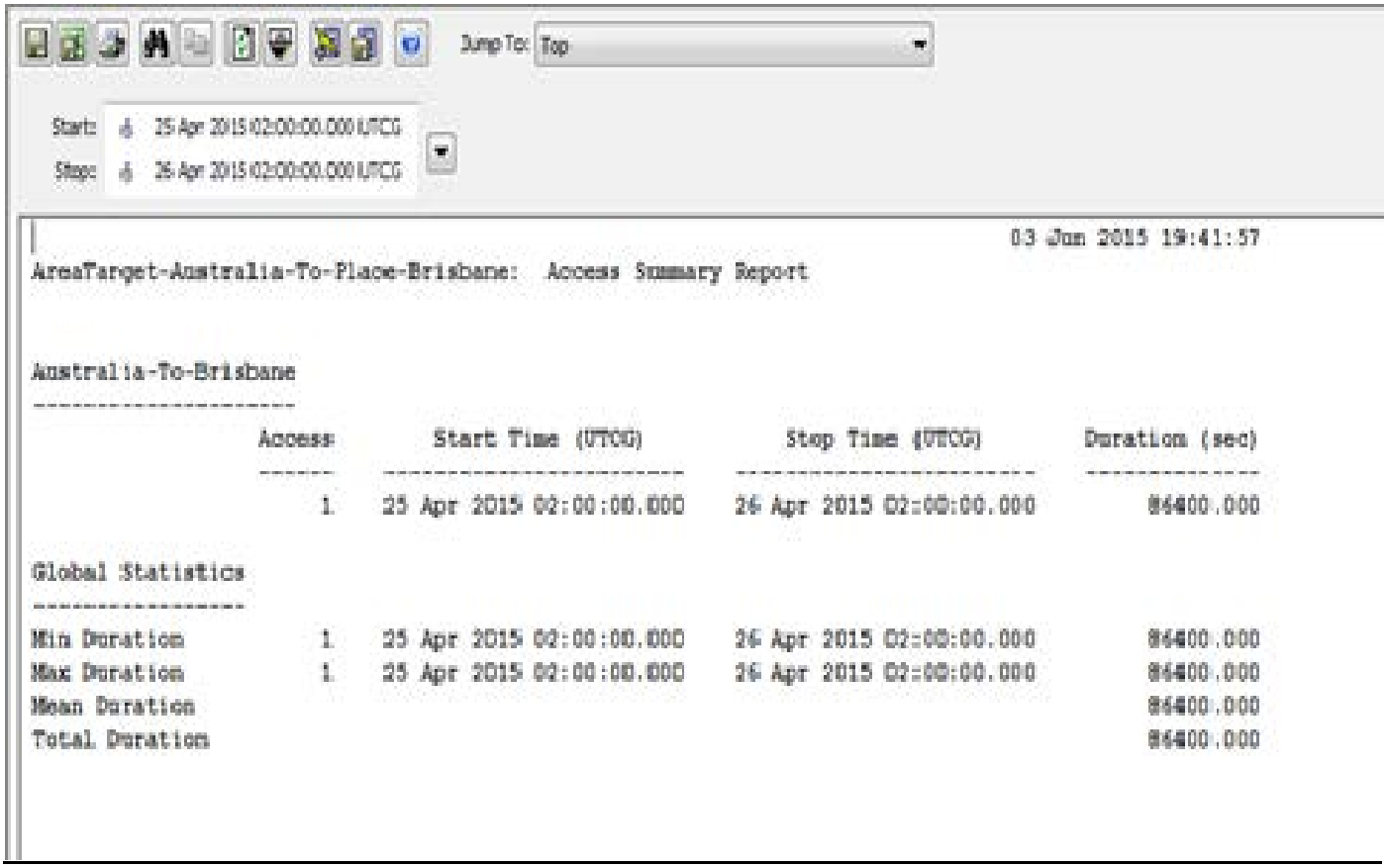

Fig 3. Access report

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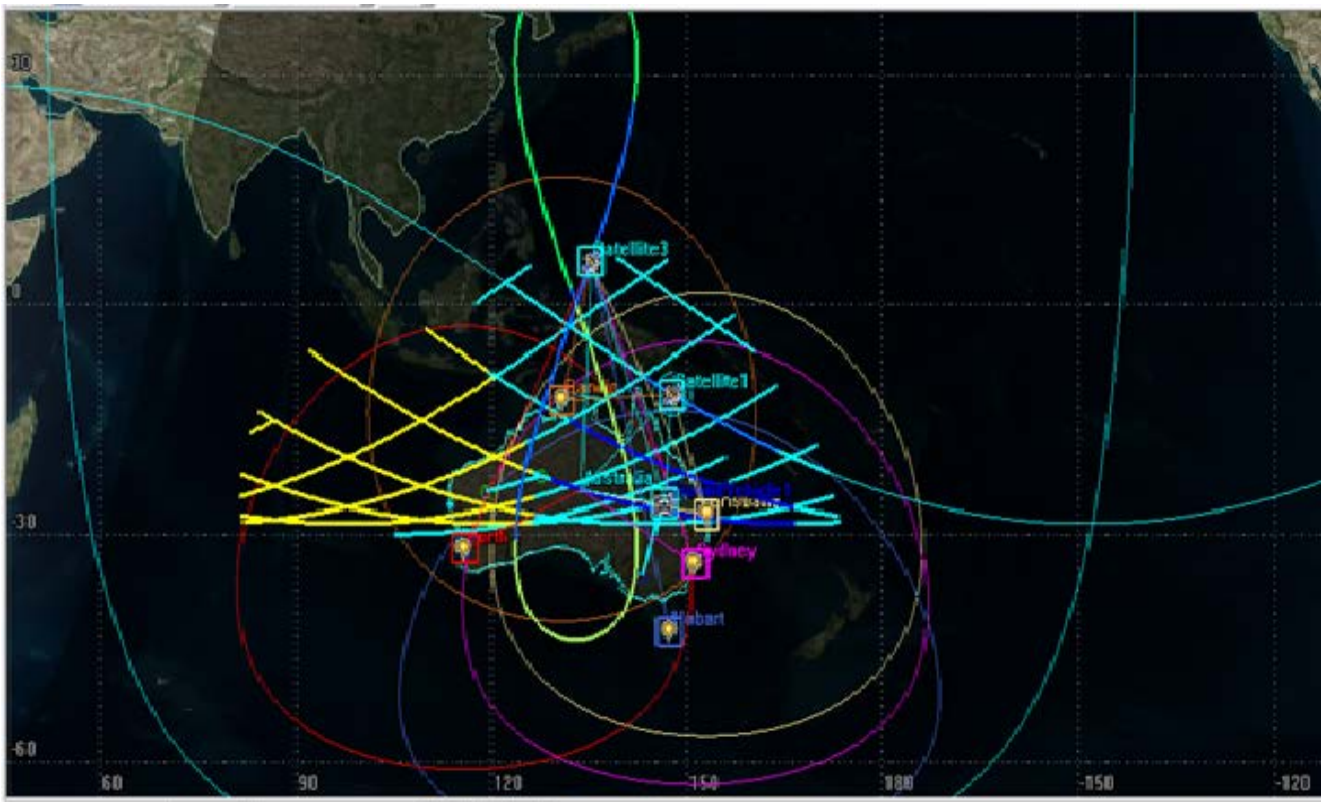

Fig 4. Bigger network

Ground vehicle will share the information with the head office through satellites that are linked with different parts of the system. The accuracy and efficiency of the update of the vehicle information always important.

4.2 More bigger network and coverage area

Bigger network and coverage area of the tracking system is shown in Fig. 4, includes two satellites, many cities and the main office. Vehicles, cities share vehicle information to the main office through satellites. This will increase the accuracy and efficiency of the update of the vehicle and keep updating to the system.

Fig. 5 and 6 show graphical analysis of ground vehicle to satellite traffic and ground vehicle within target area in Australia.

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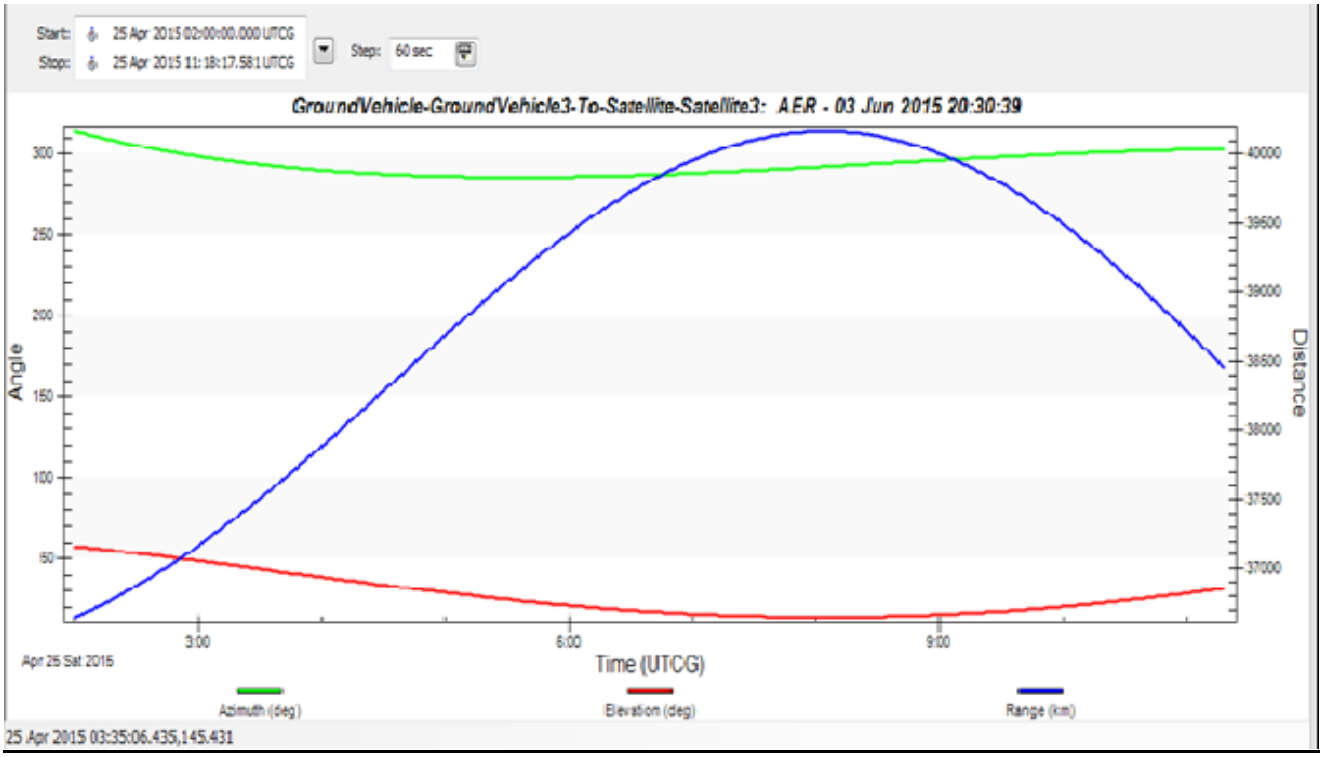

Fig. 5 Graphical analysis of the vehicle

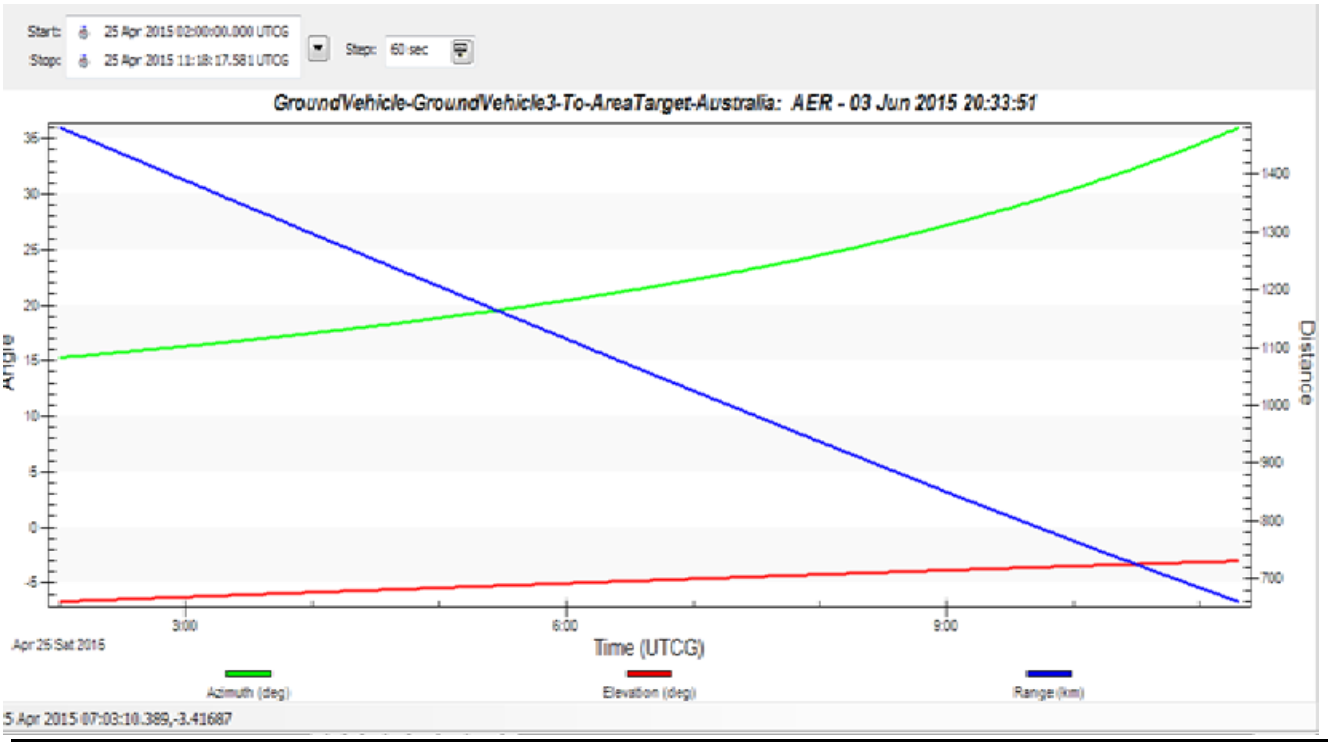

Fig. 6 Graphical analysis of satellite

5. Conclusion

According to survey report of 2013/14, 53450 cars are reported as thefts [11]. It is vital to design an efficient vehicle tracking system. This paper explains the application of GPS and GSM system for a detection of moving vehicle or object. Design methodology of the system is simulated using STK software, which proves that coverage of satellite though GPS and GSM, moving vehicle can be tracked easily. Future work will focus on mathematical formula to improve technology with wider coverage with an efficient technology.

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