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A SMART ANTI-THEFT SYSTEM FOR VEHICLE SECURITY

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Abstract

Security, especially theft security of vehicle in common parking places has become a matter of concern. An efficient automotive security system is implemented for anti-theft using an embedded system integrated with Global Positioning System (GPS) and Global System for Mobile Communication (GSM). This proposed work is an attempt to design and develop a smart anti-theft system that uses GPS and GSM system to prevent theft and to determine the exact location of vehicle. The system contains GPS module, GSM modem, Infrared sensors, DTMF decoder IC MT8870DE, 8051 microcontrollers, relay switch, vibration sensor, paint spray and high voltage mesh. GPS system track the current location of vehicle, there are two types of tracking used one is online tracking and other is offline tracking. GSM system is also installed in the vehicle for sending the information to the owner of the vehicle because GPS system can only receive the vehicle location information from satellites. In case of accident this system automatically sends the message for help to one's relatives. The preventive measures like engine ignition cut-off, fuel supply cut-off, electric shock system (installed on steering wheel) and paint spray system are installed in the vehicle which is controlled using user or owner GSM mobile. The owner can lock or unlock his/her vehicle with the help of SMS. This complete system is designed taking in consideration the low range vehicles to provide them extreme security.

Index Terms—Global positioning system (GPS), global system for mobile communications (GSM), microcontroller 8051, tracking.

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I. INTRODUCTION

These day's vehicle robbery cases are higher than any other time, it has gotten to be fundamental to give a vehicle a superb security with the main solid hostile to burglary gadget. Vehicle focal locking framework guarantees the best ensure to secure your vehicle from various types of burglary cases. It is a vehicle security gadget that offers fantastic insurance to your vehicle. However, this framework couldn't demonstrate to give complete security and openness to the vehicle in the event of burglary. So a more created framework makes utilization of an inserted framework focused around GSM innovation.

Combination of high affectability GPS units in vehicle following frameworks has empowered these gadgets to work in different varieties of situations, for example, characteristic ravines, urban gulches and much under substantial foliage, the length of system scope is solid. Right now GPS vehicle following guarantees their wellbeing as voyaging. This vehicle following framework found in client's vehicles as a burglary counteractive action and salvage gadget. Vehicle manager or Police take after the sign emitted by the following framework to place a victimized vehicle in parallel the stolen vehicle motor rate going to diminished and pushed to off. In the wake of exchanging on the motor, engine can't restart without consent of watchword.

This framework introduced for the four wheelers, Vehicle following generally utilized as a part of naval force administrators for war fleet administration capacities, directing, send off, ready for and security. The applications incorporate observing driving execution of a guardian with a teenager driver. Vehicle following frameworks acknowledged in shopper vehicles as a burglary avoidance and recovery gadget. In the event that the burglary recognized, the framework sends the SMS to the vehicle holder. After that vehicle manager sends the SMS to GSM modem appended to the controller, issue the important signs to stop the robbery.

II. HARDWARE DESCRIPTION

A. GSM Model

A smart anti-theft vehicle security system (Fig. 1) consist of GSM module, GPS module, 8051 microcontrollers, infrared sensors, DTMF decoder IC MT8870DE, relay, paint spray and high voltage mesh. The hardware design is split into two parts- GSM and GPS. The main circuit is divided into two circuits one is for detecting the motion of thief usinginfrared sensors and other is for DTMF tone decoding for switching on/off the relay. The bock diagram (Fig. 2), when thief tries to unlock the car, the infrared sensors placed near the car door will sense the motion or movement and will sent the signal to 8051 microcontrollers. The microcontroller which is connected to triggering circuit will send the triggering signal to relay. The relay is connected to GSMmobile through earphone. The microcontroller will send triggering signal three times to GSM mobile and call will be made to user informing him or her that someone is trying to unlock the vehicle

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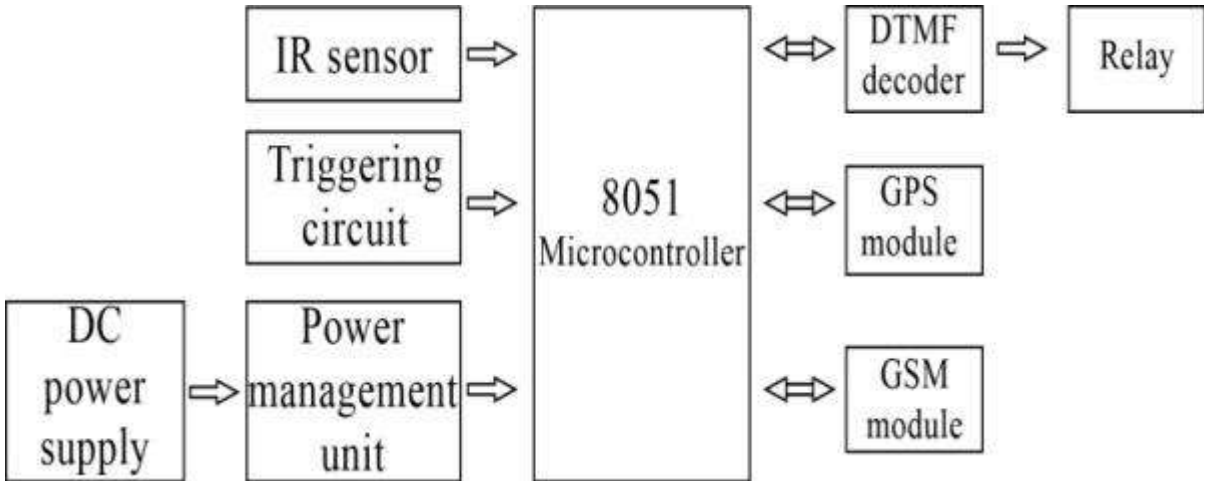

Fig. 1. Anti-theft system architecture.

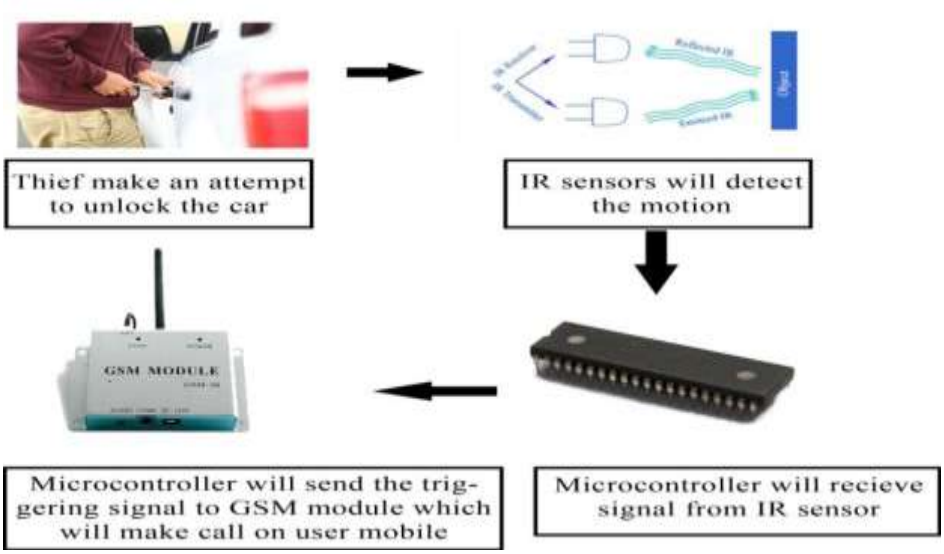

Fig. 2. Block diagram for detecting thief movement.

The second part is for controlling or switching different systems like engine ignition, fuel supply, electric shock mesh and windscreen paint spray using relay. The relay is controlled using GSM mobile and DTMF tone decoder. DTMF tone detection and decoding is provided by IC MT8870DE.This circuit detects the dial tone from a telephone line and decodes the keypad pressed on the remote telephone. The dial tone we heard when we pick up the phone set is call Dual Tone Multi-Frequency, DTMF in short. The name was given because the tone that we heard over thephone is actually making up of two distinct frequency tones, hence the name dual tone. The DTMF tone is a form of one-way communication between the dialer and the telephone exchange. A complete communication consists of the tone generator and the tone decoder. Here we are use the IC MT8870DE, the main component to decode the input dial tone to 5 digital outputs. These

digital bits can be interface to a computer or microcontroller for further application. There is particular range of frequency (Fig. 3) for each keypad number whichwill be decoded by DTMF decoder circuit. Depending upon the system like ignition cut-off, fuelsupply cut-off, windscreen paint spray and electric shock mesh, the number of relays controlling them will be added. There are four relays in the circuit each one of them controlling the preventive system like engine ignition cut-off. The owner will send the DTMF tone to the GSM mobile placed in the car. The DTMF tone will be decoded using IC MT8870DE which will be controlling relays to activate security system. For example, number 1 on the mobile keypad is assigned for engine ignition cut-off, on pressing 1 number on the keypad of your mobile phone, the DTMF decoder will decode the keypad tone frequency and microcontroller will switch the relay on-off depending upon the program burn in the microcontroller.

1	2	3	A	697Hz
4	5	6	B	770Hz
7	8	9	C	850Hz
*	0	#	D	941Hz
1209Hz	1336Hz	1477Hz	1633Hz	

Fig. 3. DTMF keypad frequencies.

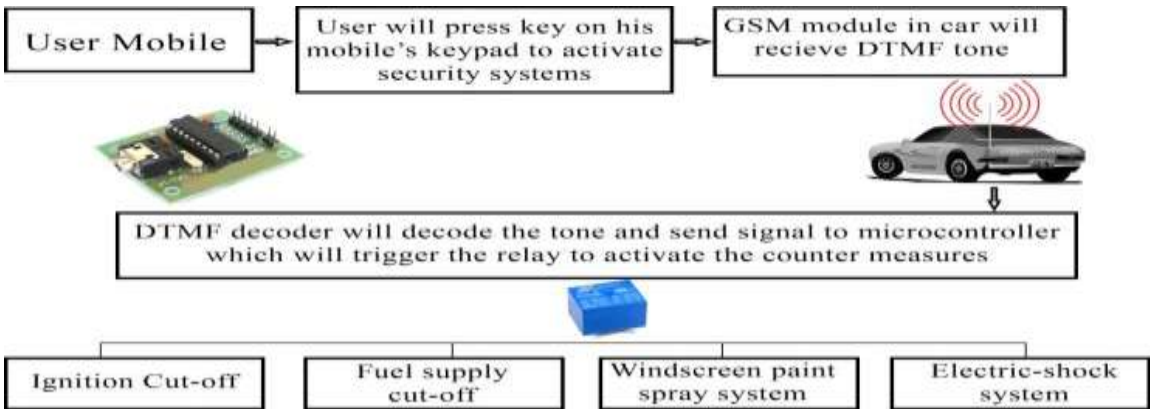

Fig. 4. Block diagram for switching different systems using DTMF decoder circuit using relay

The mechanism of security system is presented through a block diagram in Fig. 4. Whenever someone attempts to unlock the vehicle, the security components installed in the vehicle sends a signal to the owner of the vehicle via GSM modem or GSM mobile. The owner then tries to

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establish connectivity with the security system in the vehicle through calling a predefined number. Once the connectivity is established, the owner can choose one of the four actions like engine ignition cut-off, fuel supply cut-off, windscreen paint system and electric shock system as per his judgment in order to prevent the vehicle from theft. Each keypad number is assigned for controlling different system. On pressing 1 from user mobile engine ignition will cut-off, on pressing 2 fuelsupply system will cut-off, on pressing 3 electric shock system provided on steering wheel will get activated which will give shock to thief and on pressing 4 windscreen paint spray system gets activated so that thief can't drive the vehicle. The complete working model comprises of GPS and GSM system as shown in Fig. 5. Fig. 6 shows the complete circuit layout for decoding DTMF tone through which relays are controlled that further controls the preventive systems like engine ignition cut-off, fuel supply cut-off,windscreen paint spray system and electric shock system. The circuit diagram for detecting the motion of thief is shown in Fig. 7. The main components used in the circuit are microcontroller 8051 and infrared sensors.Fig. 5.

Fig. 5. GPS and GSM system for vehicle.

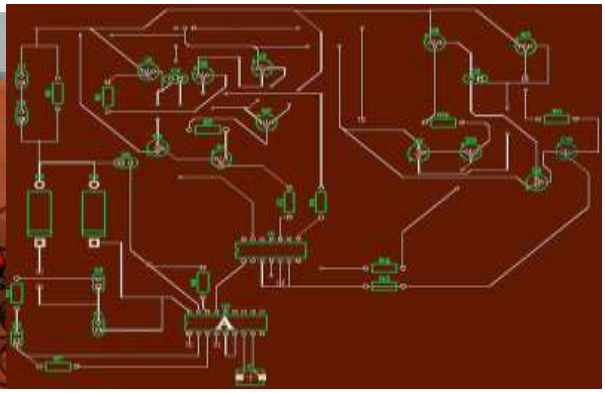

Fig. 6. DTMF tone decoding circuit layout using dip trace A (DTMF decoderIC MT8870DE).

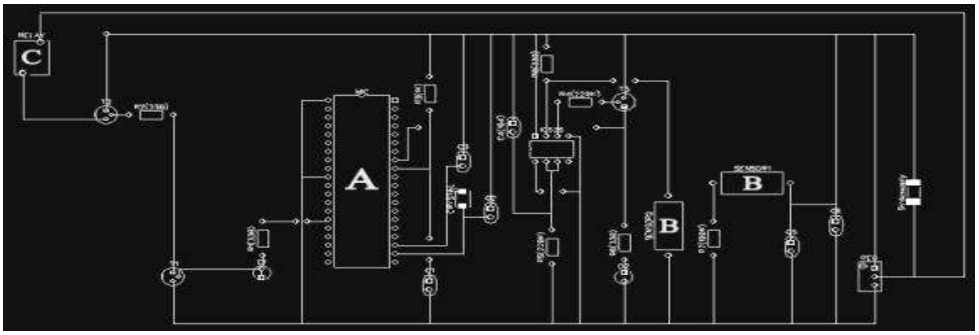

Fig. 7. Circuit diagram for sensing motion and triggering GSM mobile A (8051 Microcontroller), B (IR Sensor) & C (Relay).

III. BACKGROUND INFORMATION

GPS Model

The Global Positioning System (GPS) is a space-based satellite route framework that gives area and time data in all climate conditions, anyplace on or close to the Earth where there is an unhampered

observable pathway to four or more GPS satellites. The framework gives basic abilities to military, common and business clients as far and wide as possible. It is kept up by the United States government and is uninhibitedly open to anybody with a GPS receiver. A GPS receiver (Fig. 8) calculates its position by precisely timing the signals sent by GPS satellites high above the Earth. Each satellite continually transmits messages that include: the time the message was transmitted and satellite position attime of message transmission. The receiver uses themessages it receives to determine the transit time of each message and computes the distance to each satellite using the speed of light. Each of these distances and satellites' locations define a sphere. The receiver is on the surface of each of these spheres when the distances and the satellites locations are correct. These distances and satellites locations are used to compute the location of the receiver using the navigation equations. This location is then displayed, perhaps with a moving map display or latitude and longitude; elevation information may be included. Many GPS units show derived information such as direction and speed, calculated from position changes. In typical GPS operation, four or more satellites must be visible to obtain an accurate result.

A GPS tracking unit is a device that uses the Global Positioning System to determine the precise location of avehicle, person, or other asset to which it is attached and to record the position of the asset at regular intervals. The recorded location data can be stored within the tracking unit, or it may be transmitted to a central location data base, or to internet connected pc, using a cellular (GPRS or SMS), radio, or satellite modem embedded in the unit. This allows the asset's location to be displayed against a map backdrop either in real time or when analyzing the track later, using GPS tracking software.

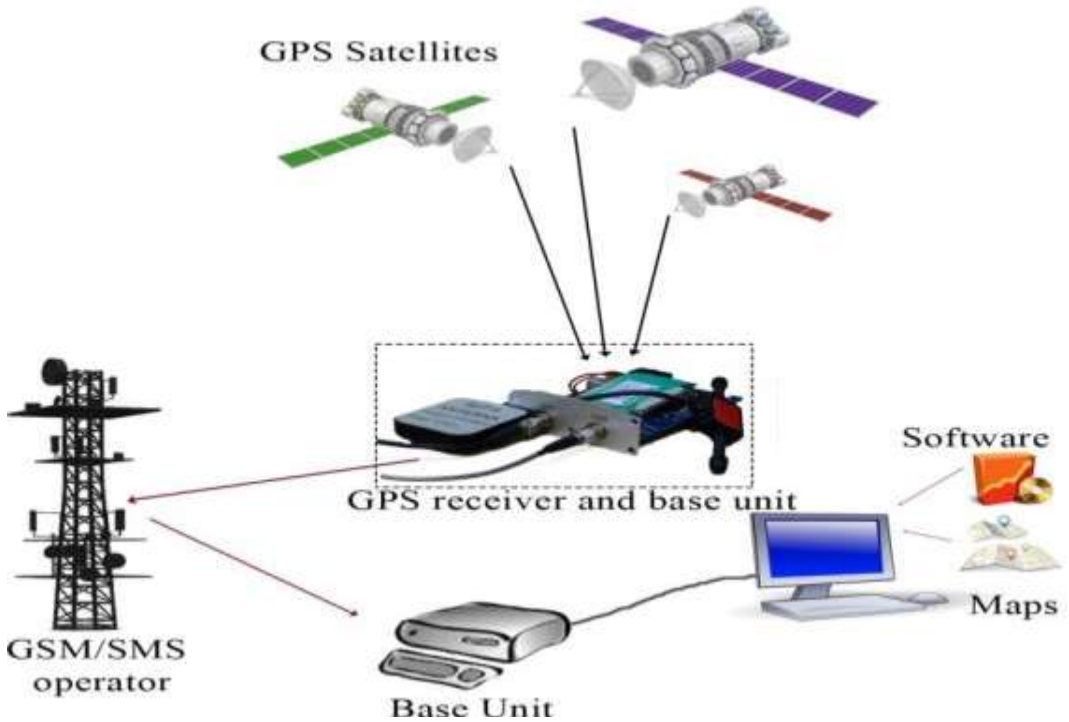

Fig. 8. Block diagram of GPS tracking system.

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TABLE I: SPECIFICATION OF GPS SYSTEM

CONTENT	SPECIFICATIONS
Dimension	83*54*26 mm
Weight	120 g
Band	850/900/1800/1900 Mhz
Network	GSM/GPRS
GSM/GPRS Module	SIM900B
GPS Module	SIRF3 chi
GPS Sensitivity	-159 dBm
GPS Accuracy	5 m
Voltage of car power system	12 V - 24V
Backup battery	3.7V 800 mAh Li-ion battery
Storage Temp	-40°C to +85°C
Operation Temp	-20°C to +65°C

IV. RESULTS AND DISCUSSION

The online based tracking framework is a framework planned by joining of a few present day data and communication technologies. The framework comprises of vehicle-mounted following gadgets, a focal server framework and web based application. Through the framework, clients will have the facility of observing the area graphically and other important data of vehicle. This framework is intended to serve undertakings with a boundless number of vehicles and complex utilization prerequisites. The online framework empowers client to scan area track on guide through created web application install Google Map and interface with database server for vehicles track subtle elements. Utilizing the online based framework empowers clients with diverse working framework stages to effectively achieve the requested subtle elements by the presence of web access. Fig. 9 demonstrates an outline of a common online based vehicle tracking framework. The area is acquisitioned from satellite utilizing GPS receiver area coordination sent through GPRS, the GSM system will pass the data to the objective server as HTTP packets. Also through the web the customers can peruse track on electronic guide utilizing reason composed web application on site. The client can discover the way of the terminus or complete course with headings (Fig. 10) where he need to experience web application.

Fig. 9. Online tracking system using web application.

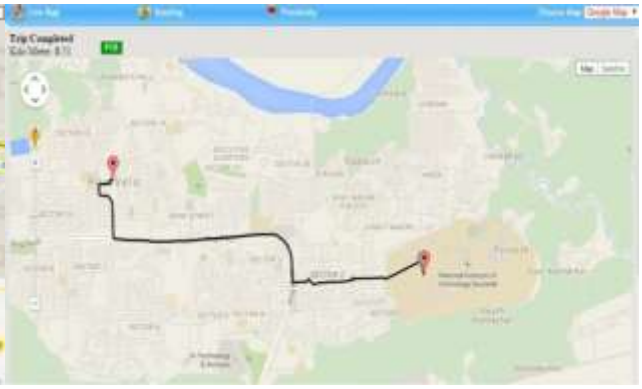

Fig. 10. Online finding the direction or destination.

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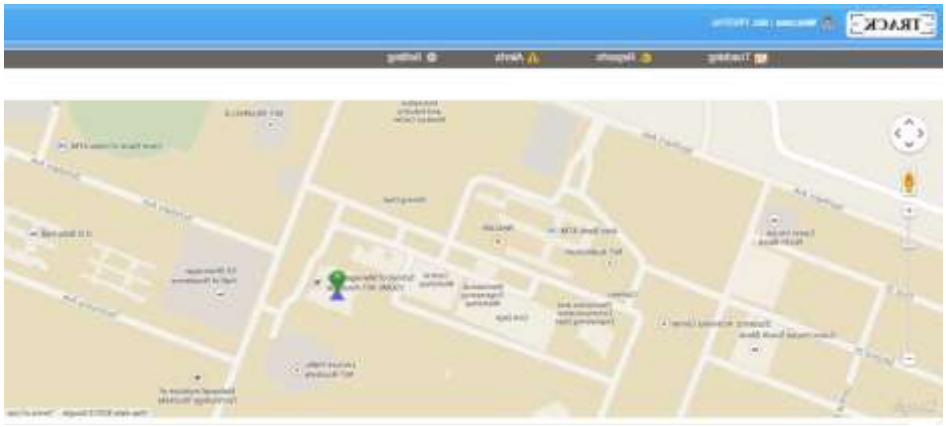

Fig. 11. History replay of vehicle

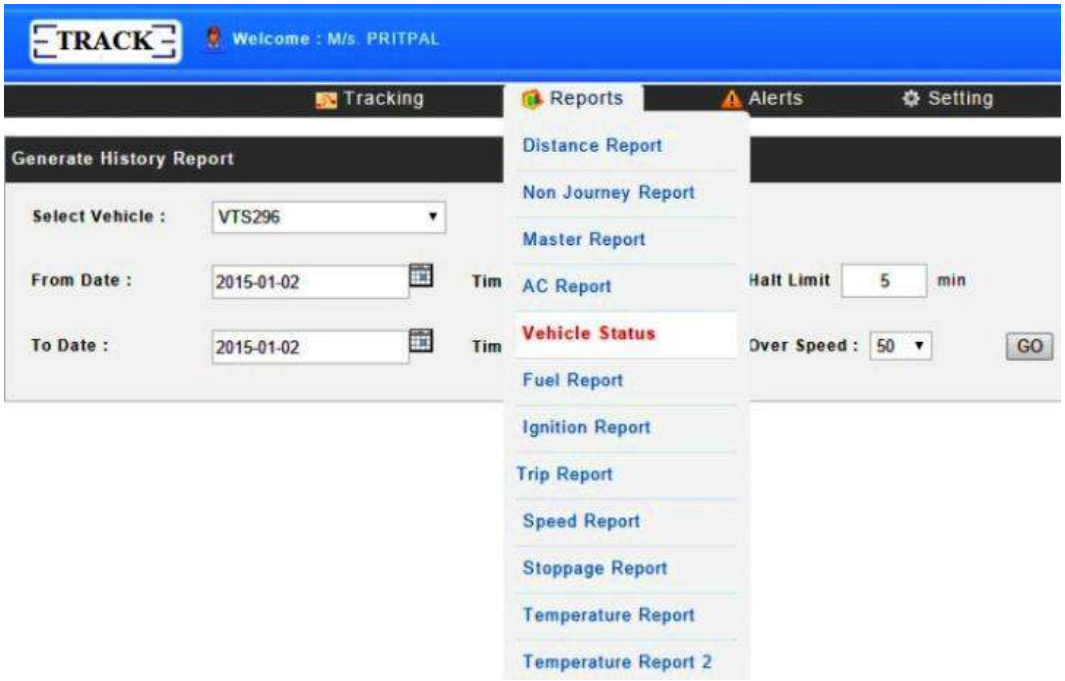

Fig. 12. Generate history report of vehicle.

Fig. 11. shows trip or history replay of vehicle on entering or selecting date and time when the journey or trip was made. Through web application (Fig. 12) the client can likewise produce history report of the vehicle. The history report ofvehicle comprises of separation secured, vehicle status (ignition on/off), fuel status, velocity report, temperature report and AC on/off report

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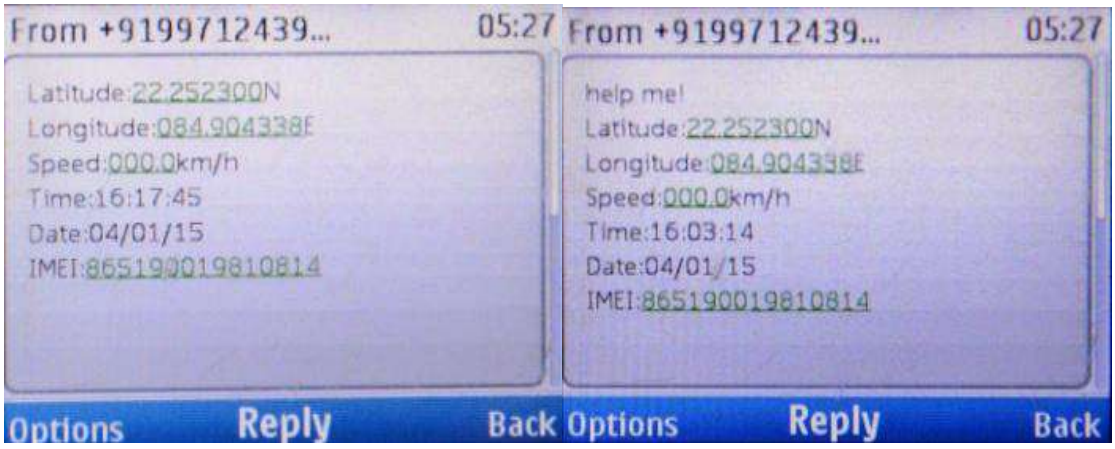

Fig. 13. Offline tracking using GSM family member

Fig. 14. MSG sent in case of accident to one of the

In offline tracking Fig. 13, GPS receiver after receiving the signal from satellites calculates the position of vehicle and convert it in the form of latitude, longitude, altitude and speed information. This information is send to the user by GSM modem or mobile phone connected to circuitry board. Incas of accident (Fig. 14), GSM modem or mobile will send the help message to one of the family member whose number is registered. The Experiment (Fig. 15) was conducted for checking the sensitivity of GPS tracking system.

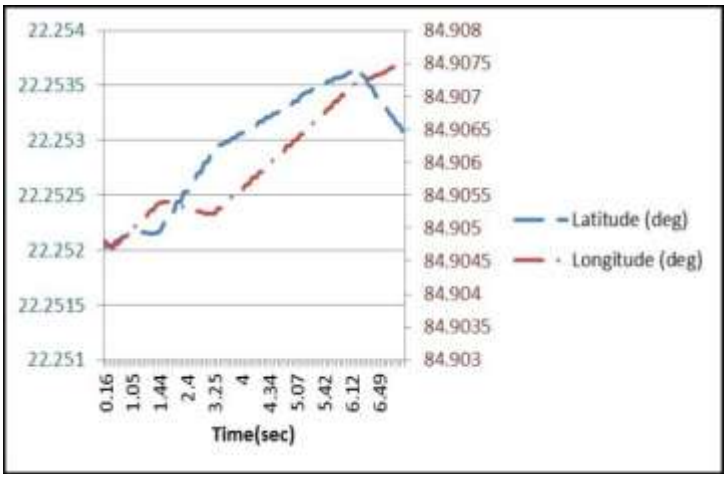

Fig. 15. Experimental result

V. CONCLUSION

Tracking framework or system is getting to be progressively vital in expansive urban areas and it is more secured than different frameworks. It has continuous ability, rises with a specific end goal to fortify the relations among individuals, vehicle and street by assembling present day data advances or technologies and ready to structures a real time accurate, compelling exhaustive transportation framework. Updating this setup is simple which makes it open to future a prerequisite which likewise makes it more efficient. The proposed work is cost-effective, reliable and has the function of preventing theft and providing accurate tracking system. Smart anti-theft system is one of the essential systems that homogenize both GPS and GSM systems. It is fundamental because of the huge numbers of uses of both GSM and GPS frameworks and the wide use of them by a great many individuals all through the world. This framework intended for clients in area development and transport business, provides real-time information such as location, speed and expected arrival time of the user is moving vehicles in a concise and easy-to-read format. This framework might likewise valuable for correspondence process among the two focuses.

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