

Designing of Innovative vehicle security system

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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 Motion Sensing Cameras (MSC) and 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 MSC to capture image of thief and GPS and GSM system to determine the exact location of vehicle. The system contains MSC device GPS module, GSM modem, Infrared sensors, DTMF decoder IC MT8870DE, 8051 microcontroller, 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 ones relatives. The preventive measures like engine ignition cutoff, fuel supply cutoff, 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. And in the keys of that particular vehicle one mini siren alarm is fixed which indicate the owner that someone is trying to stole.

Keywords: Security, Global Positioning System, Motion Sensing Cameras, DTMF decoder

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 car security with motion sensor camera innovation .this will help in instant action. We all know that there are lots of features in vehicle but those features do not protect vehicle from being stolen. our idea are little bit upgradation for vehicle. This feature protect the vehicle and inform the person before from being stolen. Although The outlined and created framework is introduced in the vehicle. Whether one is holder of single vehicle or in excess of 1000, Vehicle Tracking System (VTS) is an answer for spot, track and secure your portable resources. It is intended for exact and ongoing following and reporting of your vehicle(s), regardless of where it is placed 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 clients 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. The principle point of the present exploration work is to outline and create a shrewd and strong security framework for vehicles that can avert robbery and give data on mischances. The framework being produced through the present work utilizes GPS and GSM innovation and can be made moderate so it can be utilized as a part of ease vehicles even in bikes.

In many previous research works, the authors have given some analytical view of the circuit used in the various projects, while in some other global positioning system (GPS) is commonly used as global navigation satellite system is used to locate the vehicles and also to stop the vehicle if stolen. The location information is sent in the form of message containing latitude, longitude and speed information to the owner of the vehicle or location can also be traced using internet through Google maps. A number of developments have taken place in anti-theft systems for vehicles and some of the relevant ones are as follows. The utilization of ARM 7 microcontroller, GSM and GPS module together with an accelerometer and temperature sensor is carried out by Joshi and Mahajan [1]. The GPS and GSM module is being utilized for following the area of vehicle. The extra part is being included is the accelerometer which essentially contains the MEMS sensor offering a low pass filter and is fundamentally utilized for Shake Detection, Orientation Detection and Tap Detection. The utilization of temperature sensor is additionally being carried out with a specific end goal to acquire the vehicle engine temperature which changes over the estimation of temperature into electrical signal. A hybrid GPS-GSM localization of vehicles Tracking System has been developed by Al-Khedher [2] that portrays an incorporated GPS-GSM framework to track vehicles utilizing Google Earth application. The remote module has a GPS mounted on

the moving vehicle to recognize its present position, and to be exchanged by GSM with different parameters procured by the car's information port as a SMS to a beneficiary station. The received GPS directions or coordinates are sifted utilizing a Kalman filter to upgrade the precision of measured position. After information processing, Google Earth application is utilized to view the current area and status of every vehicle. This objective of this framework is to oversee armada, police cars dissemination and auto burglary alerts. A security system based on RFID, GPS and GSM [3] consolidate the establishment of an electronic gadget in a vehicle, with reason planned machine programming to empower the organization to track the vehicle's area. At the point when the car pics the worker; he/she needs to swap the RFID card. The micro controller matches the RFID card no. with its database records and sends the representative's id, taxi id & the taxicab position co-ordinates to the organization unit by means of GSM module. The GSM Modem will get the message through GSM in the organization unit. On the off chance that worker ends up/herself in an issue, he/she will press the catch. Microcontroller will distinguish the activity and sends a signal to the GSM which will arrange with to the organization unit and police. The configuration and advancement of a burglary control framework for an automobile, which is being utilized to anticipate/control the robbery of a vehicle has been accounted for by Wankhade and Dahad [4]. The created framework makes utilization of an implanted framework focused around Global System for Mobile correspondence (GSM) engineering. The planned and created framework is introduced in the vehicle. An interfacing portable is additionally associated with the microcontroller, which is thusly, joined with the engine. Once, the vehicle is being stolen, the data is being utilized by the vehicle manager for further handling. The data is passed onto the focal handling protection framework which is as the sms, the microcontroller unit peruses the sms and sends it to the Global Positioning System (GPS) module and utilizing the triangulation system, GPS module sustains the precise area as scope and longitude to the client's versatile. Shaikh et al. [5] describe arm7 based smart car security system. The principle point of this undertaking is to offer a development security framework in automobile, which comprises of a face detection subsystem, a GPS module, a GSM module and a control stage. The face location subsystem can discover confronts in vehicle amid the period in which no one ought to be in the auto, and make an alert uproariously or soundlessly. Alternate modules transmit vital data to clients and help to keep eyes on vehicle constantly, actually when the vehicle is lost. This framework model is based on the base of one inserted stage Arm7 which controls all the processes. Jianming et al. [6] describe vehicles against robbery framework utilizing GSM and GPS module. The framework is created utilizing fast blended sort single-chip C8051f120 and stolen vehicle is discovered by the utilization of vibration sensor. The framework stays in contact with auto holder through the GSM module, for the safety and reliability of car. Kaushik et al. [7] depicts an Anti-burglary vehicle security framework which plans to permit access to the vehicle just if the individual's finger impression matches with that put away in the framework. The correlation will happen in Matlab and result will be demonstrated on the LCD. On the off chance

that through illicit means the vehicle is accessed then vehicle fuel tank will be bolted through Relay circuit so that at whatever point the tank gets unfilled, unapproved individual will never again have the capacity to refuel the tank. Ibrahim et al. [8] describe a hostile to burglary security framework that uses an installed framework outline with Dual Tone Multi Frequency (DTMF) and a GSM to screen and shield an automobile. It secures the auto or vehicle against burglary. Upon actuation, it naturally grounds the auto by detaching the ignition scratch supply from the auto battery. In an attempt of theft through the car doors or boot, the system sends text message to the car owner and at the same time starts up an alarm. Nagaraja et al. [9] describe the outline and improvement of a GSM based vehicle robbery control framework for a car. The created framework makes utilization of an inserted framework focused around GSM innovation. An interfacing mobile or GSM modem is associated with the microcontroller, which in term is joined with the engine through relay. In the event that the vehicle is stolen, the data is sent to the owner that somebody has stolen his vehicle. After that the user or owner will send the message to GSM modem or mobile which is joined with motor ignition through transfer or relay to switch off the engine. Rashed et al. [10] describe a GPS based tracking system that keeps track of the location of a vehicle and its speed based on a mobile phone text messaging system. The system is able to provide real-time text alerts for speed and location. The present location can be locked and the system will alert the owner if the vehicle is moved from its present locked location. In every one hour the GSM modem or mobile will inform the owner by messaging its location in the form of latitude, longitude and speed information. The owner or user can control or stop the vehicle by simply sending the message stop to GSM modem or mobile connected to circuitry board. After receiving that message ignition system will turn off.

II. HARDWARE DESCRIPTION

A. Motion Sensing Camera

To understand motion detection, you first need to understand how a camera works. Inside the camera is an image sensor, which the camera lens directs light to - when light hits the image sensor each individual pixel records how much light it's getting. That pattern of light and dark areas on the pixels becomes the complete video image you see.

Monitoring your data centers and building access points with CCD cameras can represent a boon to your overall security, but you need to know a little about camera terminology to make the best use of them. Don't think about "aim and shoot" when you think about these cameras. Think, instead, about how you might go about detecting motion in a series of still images.

First off, let's examine the term "CCD". This stands for "charge-coupled device". A CCD is a silicon chip with a surface that is divided into light-sensitive pixels. When light hits these pixels, tiny electric charges are generated. With enough of these pixels, you can get a fairly high resolution image. With adequate "sensitivity" (a term to be defined further down in this article), you can detect motion even in a dimly lit room. Initially designed as a memory device, CCD became a good choice for image sensing because of its ultra

sensitivity to light. Astronomers used the technology because it was as much as 100 times as sensitive as film and allowed previously invisible objects to be viewed.

Digital cameras can use CCD or CMOS (complementary metal-oxide-semiconductor) circuitry. However, CCD produces higher quality images. Thus, security cameras generally use CCD technology. The difference between digital cameras and security cameras is in their basic way of working. Digital cameras store images when you tell them to. Security cameras only provide images (save and transmit them) when they detect motion. And motion detection is basically the process of comparing sequential images and determining whether the differences between them represent motion. If there are significant differences between two consecutive images, the cameras "conclude" that there has been motion within the camera view. They do this based on a couple important settings -- sensitivity and percentage. Most, if not all, surveillance cameras will give you the option of selecting a particular area within the viewing screen to be monitored. In other words, you can say that you only want to detect motion in one area - - say the door or window. There are two types of image changes that can occur. We can have an overall change in the pixels as we would if the lights in the room went on or off. If the room has windows through which incoming light will enter, you probably don't want to generate motion detection photos just because the sun is setting. So, you can select a "sensitivity" setting that provides a contrast setting and determines how much of a change should be reported.

B. Alarm Light Indicator

Eaton's addressable loop connected LED alarm beacon is designed to complement audible alarms for use in areas where people may have impaired hearing or areas with high ambient noise levels - ensuring an all-inclusive notification system. The flashing LED beacon is designed and has a built-in short circuit isolator and is soft addressed for ease of installation. High light output, low power consumption. With multiple LED's combined with a careful optical design, the beacon is designed to provide a high-intensity flash using low current consumption.

C. Arduino



Fig. 1: Arduino

The Arduino Uno is an open-source microcontroller board based on the Microchip ATmega328P microcontroller and developed by Arduino.cc as shown in figure 1. The board is equipped with sets of digital and analog input/output (I/O) pins that may be interfaced to various expansion boards (shields) and other circuits.

The board has 14 digital I/O pins (six capable of PWM output), 6 analog I/O pins, and is programmable with the Arduino IDE (Integrated Development Environment), via a type B USB cable. It can be powered by the USB cable or by an external 9-volt battery, though it accepts voltages between 7 and 20 volts. It is similar to the Arduino Nano and Leonardo. The hardware reference design is distributed under a Creative Commons Attribution Share-Alike 2.5 license and is available on the Arduino website. Layout and production files for some versions of the hardware are also available.

The word "uno" means "one" in Italian and was chosen to mark the initial release of Arduino Software. The Uno board is the first in a series of USB-based Arduino boards; it and version 1.0 of the Arduino IDE were the reference versions of Arduino, which have now evolved to newer releases. The ATmega328 on the board comes preprogrammed with a bootloader that allows uploading new code to it without the use of an external hardware programmer.

While the Uno communicates using the original STK500 protocol, it differs from all preceding boards in that it does not use the FTDI USB-to-serial driver chip. Instead, it uses the ATmega16U2 (ATmega8U2 up to version R2) programmed as a USB-to-serial converter as shown in figure 2.



Fig. 2: Atmega 16U2

The PIR sensor itself has two slots in it, each slot is made of a special material that is sensitive to IR. The lens used here is not really doing much and so we see that the two slots can 'see' out past some distance (basically the sensitivity of the sensor). When the sensor is idle, both slots detect the same amount of IR, the ambient amount radiated from the room or walls or outdoors. When a warm body like a human or animal passes by, it first intercepts one half of the PIR sensor, which causes a *positive differential* change between the two halves. When the warm body leaves the sensing area, the reverse happens, whereby the sensor generates a *negative differential* change. These change pulses are what is detected.

D. Buzzer



Fig. 3: Buzzer

A buzzer or beeper is an audio signalling device, which may be mechanical, electromechanical, or piezoelectric (*piezo* for short). Typical uses of buzzers and beepers include alarm devices, timers, and confirmation of user input such as a mouse click or keystroke as shown in figure 3.

E. Resistor



Fig. 4: Resistor

A resistor is a passive two-terminal electrical component that implements electrical resistance as a circuit element as shown in figure 4. In electronic circuits, resistors are used to reduce current flow, adjust signal levels, to divide voltages, bias active elements, and terminate transmission lines, among other uses. High-power resistors that can dissipate many watts of electrical power as heat, may be used as part of motor controls, in power distribution systems, or as test loads for generators. Fixed resistors have resistances that only change slightly with temperature, time or operating voltage. Variable resistors can be used to adjust circuit elements (such as a volume control or a lamp dimmer), or as sensing devices for heat, light, humidity, force, or chemical activity.

The electrical function of a resistor is specified by its resistance: common commercial resistors are manufactured over a range of more than nine orders of magnitude. The nominal value of the resistance falls within the manufacturing tolerance, indicated on the component.

F. LED



Figure 5 LED

A light-emitting diode (LED) is a semiconductor light source that emits light when current flows through it as shown in figure 5. Electrons in the semiconductor recombine with electron holes, releasing energy in the form of photons. The color of the light (corresponding to the energy of the photons) is determined by the energy required for electrons to cross the band gap of the semiconductor. White light is obtained by using multiple semiconductors or a layer of light-emitting phosphor on the semiconductor device.

G. Potentiometer



Fig. 6: Potentiometer

A potentiometer is a three-terminal resistor with a sliding or rotating contact that forms an adjustable voltage divider as shown in figure 6. If only two terminals are used, one end and the wiper, it acts as a variable resistor or rheostat. Potentiometers are commonly used to control electrical devices such as volume controls on audio equipment. Potentiometers operated by a mechanism can be used as position transducers, for example, in a joystick. Potentiometers are rarely used to directly control significant power (more than a watt), since the power dissipated in the potentiometer would be comparable to the power in the controlled load.

H. Motion Sensor Camera



Fig. 7: Motion Sensor Camera

It will capture the picture of the unknown person whoever try to start the particular vehicle as shown in figure 7. A hidden camera can be wired or wireless. The former will be connected by cable to a viewing or recording device, such as a TV, VCR, network video recorder (NVR), digital video recorder (DVR), memory card or other data storage medium; whereas a wireless hidden camera can transmit a video signal to a receiver within a small radius, where the images may be viewed or recorded. Hidden cameras may also have an audio capability. A hidden camera may be activated manually, by remote control or be connected to a motion detector.

I. Working of locking system in vehicle

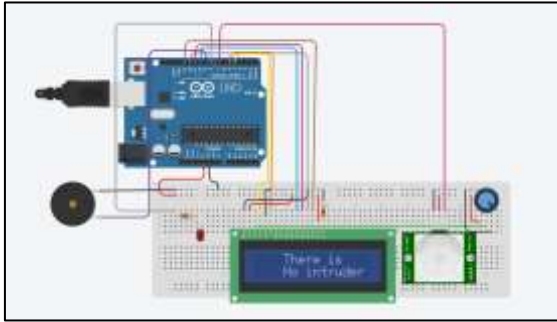


Fig. 8: GSM Model Circuit Diagram

J. GSM Model

A smart anti-theft vehicle security system consists of GSM module, GPS module, 8051 microcontroller, infrared sensors, DTMF decoder IC MT8870DE, relay, paint spray and high voltage mesh as shown in figure 8. 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 using infrared sensors and other is for DTMF tone decoding for switching on/off the relay. The block diagram when thief tries to unlock the car, the infrared sensors placed near the car door will sense the motion or movement and will send the signal to 8051 microcontroller as shown in figure 9. The microcontroller which is connected to triggering circuit will send the triggering signal to relay. The relay is connected to GSM mobile 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.

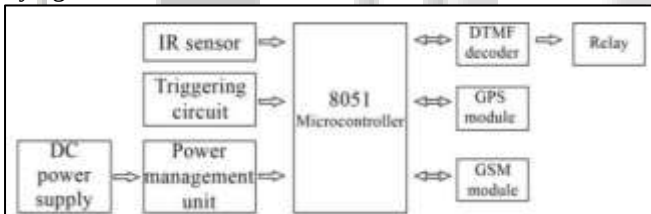


Fig. 9: GSM Model (a)

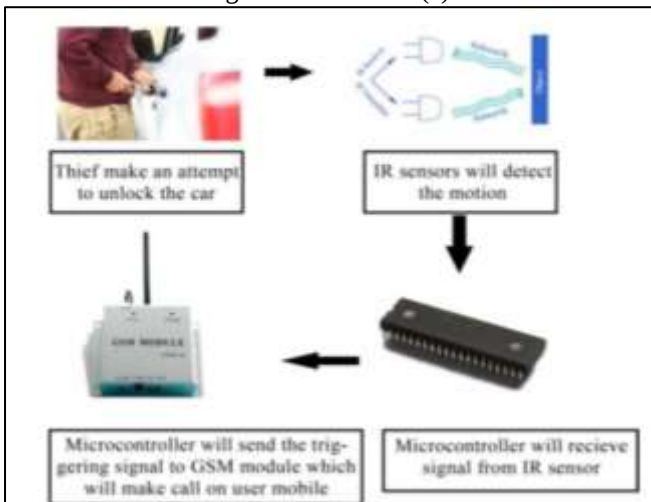


Fig. 9: GSM Model (b)

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 the phone 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 which will be decoded by DTMF decoder circuit. Depending upon the system like ignition cut-off, fuel supply 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 as shown in figure 10. 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.

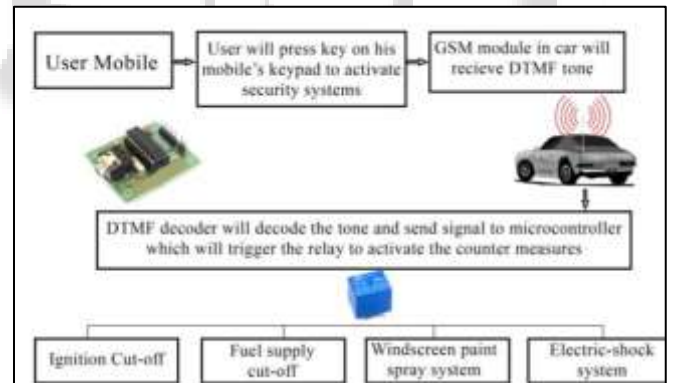


Fig. 10: DTMF Decoder

The mechanism of security system is presented through a block diagram in 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 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 fuel supply 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.

K. Circuit Design for GPS-

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 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 at time of message transmission. The receiver uses the messages 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 a vehicle, 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.

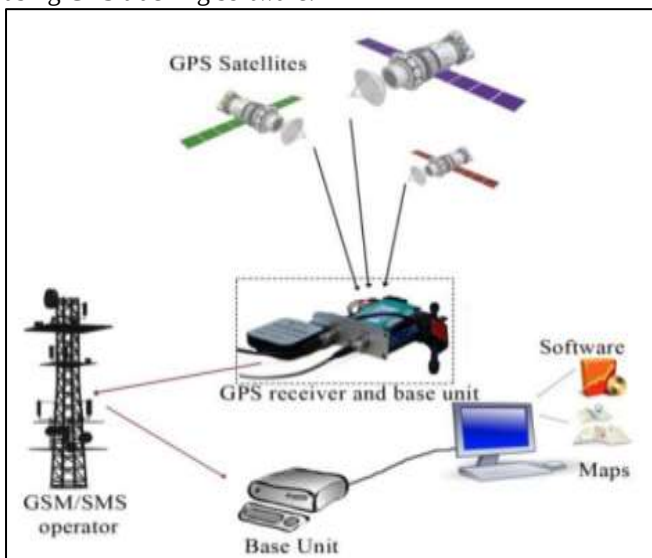


Fig. 11: GPS circuit diagram

III. RESULTS AND DISCUSSION

The security based tracking framework is a framework planned by joining of a innovation in vehicle security framework is intended to serve undertakings with a boundless number of vehicles and complex utilization prerequisites. This framework vehicle security feature which help the vehicle owner and safe his car by informing before from being stolen. 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.

IV. CONCLUSION

Security framework or system is getting to be less expensive 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 informing the person before stolen of vehicle. This framework might likewise valuable for correspondence process among the two focuses. 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. A 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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