

# **GSM BASED ANTI-THEFT SYSTEM FOR AUTOMOBILES**

*Project report submitted in fulfilment of the requirements for the degree of*

## **BACHELOR OF TECHNOLOGY IN ELECTRONICS & COMMUNICATION ENGINEERING**

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## DECLARATION BY SCHOLAR

We hereby declare that the work reported in the B-Tech thesis entitled “**GSM Based Anti-Theft System for Automobiles**” submitted at **Jaypee University of Information Technology, Wagnaghat, India**, is an authentic record of our work carried out under the supervision of **Dr. Meenakshi Sood**. We have not submitted this work elsewhere for any other degree or diploma.

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### CERTIFICATE

This is to certify that the work reported in the B-Tech thesis entitled “**GSM Based Antitheft System for Automobiles**” which is being submitted by **Dr. Meenakshi Sood** in fulfilment for the award of degree of Bachelor of Technology in Electronics and Communication Engineering by the Jaypee University of Information Technology, is the record of candidate’s own work carried out by them under my supervision. This work is original and has not been submitted partially or fully anywhere else for any other degree or diploma.

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विद्या तत्व ज्योतिषमः

## ACKNOWLEDGEMENT

*“Nothing in this world will take the place of persistence. Talent will not; Nothing is uncommon than man with talent, Genius will not; Unrecorded genius is almost a proverb, Education alone will not; the world is full of derelict, Persistence and determination are omnipotent.”*

The zeal to accomplish the task of formulating this project on “GSM Based Antitheft System for Automobiles” could not have been realised without the support and cooperation of the members of **ECE Department**. We wish to express our gratitude and indebtedness towards our project guide **Dr. Meenakshi Sood** (Assistant Professor, Electronics and Communication Department) for her encouragement, guidance and valuable assistance which helped us to complete this project successfully. She helped us to develop novel solutions to every problem and helped us to emerge with good engineering acumen.

We are at loss of words to express our obligation towards our Head of Department **Professor (Dr.) Sunil VidyaBhooshan** who made us realise the fact that stumbling blocks were in fact stepping stones to success. He motivated us to take this project as a challenge and come out with flying colours.

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## **ABSTRACT**

Car theft cases are higher than ever, an excellent protection can be provided with reliable anti-theft system. Car central locking system ensures the best guarantee to protect your car from different kinds of theft cases. It is a car security device that offers excellent protection to car.

A car with central locking security system helps the user to lock and unlock doors at the press of a button. Again this system could not prove to provide complete security and accessibility of the vehicle in case of theft. So a more developed system makes use of an embedded system based on GSM technology.

The designed & developed system is installed in the vehicle. The main concept in this design is introducing the mobile communications into the embedded system.

A vehicle tracking system combines the installation of an electronic device in a vehicle with purpose-designed computer software to enable the owner to track the vehicle's location, collecting data in the process.

Modern vehicle tracking systems commonly use Global Positioning System (GPS) technology for locating the vehicle. Vehicle information can be viewed on electronic maps via the Internet or specialized software. To avoid this kind of steal we are going to implement a system it provides more security to the vehicle.

The RF transmitter is attached with the vehicle which has its own identification. This data will be continuously transmitted to the receiver connected to the microcontroller. This GPS will be locating the position of vehicle and transmit that data to the microcontroller. Suppose the RF receiver is not receiving signal from the transmitting unit, receiver unit send the signal to the microcontroller, from that we can identify the theft. If the vehicle is stolen, it automatically sends location of the vehicle to its owner as a SMS through GSM modem. This is a much simpler and low cost technique compared to others.



## **LIST OF ACRONYMS**

AT Command	Attention command
GPRS	General Packet Radio Service
GPS	Global Positioning System
GSM	Global System for Mobile Communication
I/O	Input/output
MCU	Multipoint Control Unit
OMC	Operations and Maintenance Centre
PIO	Programmed Input Output
RAM	Random Access Memory
RF	Universal Serial Bus
ROM	Read Only Memory
SPI	Serial Peripheral Interface Bus
UART	Universal Asynchronous Receiver/Transmitter
USB	Universal Serial Bus

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# **CHAPTER 1**

## **INTRODUCTION**

With advancement of technology things are becoming simpler and easier for us. Automatic systems are being preferred over manual system. Through this project we have tried to show how to Design AVR and Arduino based car theft tracking system withGPS AND IGNITION CONTROL.

An automated device can replace good amount of human working force, moreover humans are more prone to errors and in intensive conditions the probability of error increases. Whereas an automated device can work with diligence, versatility and with almost zero error. This is why this project looks into construction and implementation of a system involving hardware to control a variety of electrical and electronics system. Most of tracking systems are made by using GPS. This is very simple and cheap.

Tracking systems are mostly used by fleet operators for tracking a vehicle location, routing and others. This is a very good method for preventing our vehicles from stolen. This tracking system sends us the geographical coordinates and by using these coordinates we can track our vehicle position on electronic maps using internet. By using these tacking systems we can share real time information about transportations. And also can be share real time information or position of trains and buses with passengers.

GSM and GPS based vehicle location and tracking system will provide effective, real time vehicle location, mapping and reporting this information value and ads by improving the level of service provided. A GPS-based vehicle tracking system will inform where your vehicle is and where it has been, how long it has been. The system uses geographic position and time information from the Global Positioning Satellites.

## **1.1 VEHICLE TRACKING SYSTEM**

A vehicle tracking system combines the installation of an electronic device in a vehicle, or fleet of vehicles, with purpose designed computer software at least at one operational base to enable the owner to track the vehicle's location, collecting data in the process from the field and deliver it to the base of operation. Modern vehicle tracking systems commonly use GPS technology for locating the vehicle, but other types of automatic vehicle location technology can also be used. Vehicle information can be viewed on electronic maps via the Internet or specialized software.

Vehicle tracking systems are also popular in consumer vehicles as a theft prevention and retrieval device. Police can simply follow the signal emitted by the tracking system and locate the stolen vehicle. When used as a security system, a Vehicle Tracking System may serve as either an addition to or replacement for a traditional Car alarm. Some vehicle tracking systems make it possible to control vehicle remotely, including block doors or engine in case of emergency. The existence of vehicle tracking device then can be used to reduce the insurance cost.

Global System for Mobile Communications or GSM is the world's most popular standard for mobile telephone systems. The GSM Association estimates that 80% of the global mobile market uses the standard. GSM is used by over 1.5 billion people across more than 212 countries and territories. This ubiquity means that subscribers can use their phones throughout the world, enabled by international roaming arrangements between mobile network operators. GSM differs from its predecessor technologies in that both signalling and speech channels are digital, and thus GSM is considered a second generation (2G) mobile phone system.

The GSM standard has been an advantage to both consumers, who may benefit from the ability to roam and switch carriers without replacing phones, and also to network operators, who can choose equipment from many GSM equipment vendors. The Global Positioning System (GPS) is a space-based global navigation satellite system (GNSS) that provides reliable location and time information in all weather and at all times and anywhere on or near the Earth when and where there is an unobstructed line of sight to

four or more GPS satellites. It is maintained by the United States government and is freely accessible by anyone with a GPS receiver. The GPS project was started in 1973 to overcome the limitations of previous navigation systems, integrating ideas from several predecessors, including a number of classified engineering design studies from the 1960s. GPS was created and realized by the U.S. Department of Defence (USDOD) and was originally run with 24 satellites. It became fully operational in 1994.



**Figure 1.1** GSM and GPS Module

We just need to install your Arduino with the GPRS+GPS Quad band Module (SIM808) in a hidden place in your car, maybe in your trunk, in the glove compartment or under your spare tyre. Then connect the GPRS-GSM and the GPS antenna and a SIM card, all of this powered with a battery.

First of all we have to call the police of course, but you can help them a lot. If your car is not parked where do you think, something is wrong. Call immediately to your Arduino, hidden in your car, and it will send you an SMS with the location, longitude and latitude at the moment and it also sends GPS data to a web server with the real time position (Google Maps). This GPRS-GSM shield is programmed to recognize your number and only if it is correct it will send you this data.

## 1.2 GSM TECHNOLOGY

GSM Modem Global system for mobile communication (GSM) is a globally accepted standard for digital cellular communication.

GSM is the name of a standardization group established in 1982 to create a common European mobile telephone standard that would formulate specifications for a pan-European mobile cellular radio system operating at 900 MHz.

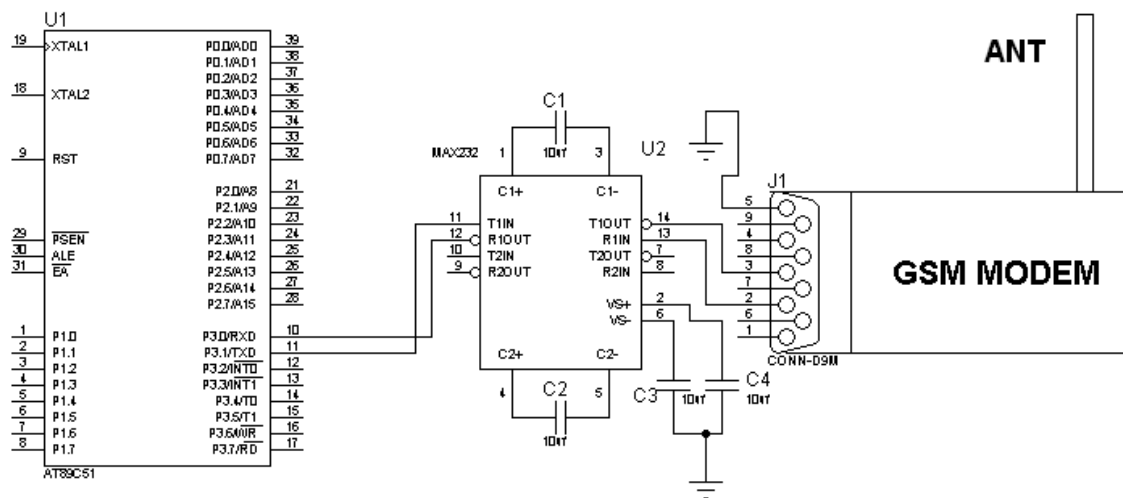


**Figure 1.2**GSM Modem

A GSM modem is a wireless modem that works with a GSM wireless network. A wireless modem behaves like a dial-up modem. The main difference between them is that a dial-up modem sends and receives data through a fixed telephone line while a wireless modem sends and receives data through radio waves. The working of GSM modem is based on commands, the commands always start with AT and finish with a character. The GSM modem is serially interfaced with the controller with the help of MAX 232.

### 1.2.1 Circuit diagram

Originally it had been intended that GSM would operate on frequencies in the 900 MHz cellular band. In September 1993, the British operator Mercury One-to-One launched a network. Termed DCS 1800 it operated at frequencies in a new 1800 MHz band.



**Figure 1.3** GSM Modem Circuit Diagram

In view of the higher frequency used the distances the signals travelled was slightly shorter but this was compensated for by additional base stations. In the USA as well a portion of spectrum at 1900 MHz was allocated for cellular usage in 1994. The licensing body, the FCC, did not legislate which technology should be used, and accordingly this enabled GSM to gain a foothold in the US market. This system was known as PCS 1900 (Personal Communication System).

### 1.2.2 History of GSM

During the early 1980s, analog cellular telephone systems were experiencing rapid growth in Europe, particularly in Scandinavia and the United Kingdom, but also in France and Germany. Each country developed its own system, which was incompatible with everyone else's in equipment and operation. This was an undesirable situation, because not only was the mobile equipment limited to operation within national boundaries, which in a unified Europe were increasingly unimportant. But there was also a very limited market for each type of equipment, so economies of scale and the subsequent savings could not be realized.

The Europeans realized this early on, and in 1982 the Conference of European Posts and Telegraphs (CEPT) formed a study group called the Groupe Spécial Mobile (GSM) to study and develop a pan-European public land mobile system. The proposed system had to meet certain criteria:

- Good subjective speech quality
- Low terminal and service cost
- Support for international roaming
- Ability to support handheld terminals
- Support for range of new services and facilities
- Spectral efficiency
- ISDN compatibility

In 1989, GSM responsibility was transferred to the European Telecommunication Standards Institute (ETSI), and phase I of the GSM specifications were published in 1990. Commercial service was started in mid-1991, and by 1993 there were 36 GSM networks in 22 countries. Although standardized in Europe, GSM is not only a European standard. Over 200 GSM networks (including DCS1800 and PCS1900) are operational in 110 countries around the world.

### **1.2.3 Services Provided By GSM**

From the beginning, the planners of GSM wanted ISDN compatibility in terms of the services offered and the control signalling used. However, radio transmission limitations, in terms of bandwidth and cost, do not allow the standard ISDN B-channel bit rate of 64 kbps to be practically achieved. There is also an emergency service, where the nearest emergency-service provider is notified by dialling three digits.



## 1.2.4 Architecture of GSM Network

A GSM network is composed of several functional entities, whose functions and interfaces are specified. The GSM network can be divided into three broad parts. The Mobile Station is carried by the subscriber. The Base Station Subsystem controls the radio link with the Mobile Station.

The Network Subsystem, the main part of which is the Mobile services Switching Centre (MSC), performs the switching of calls between the mobile users, and between mobile and fixed network users. The Mobile Station and the Base Station Subsystem communicate across the Um interface, also known as the air interface or radio link. The Base Station Subsystem communicates with the Mobile services Switching Centre across the A interface.

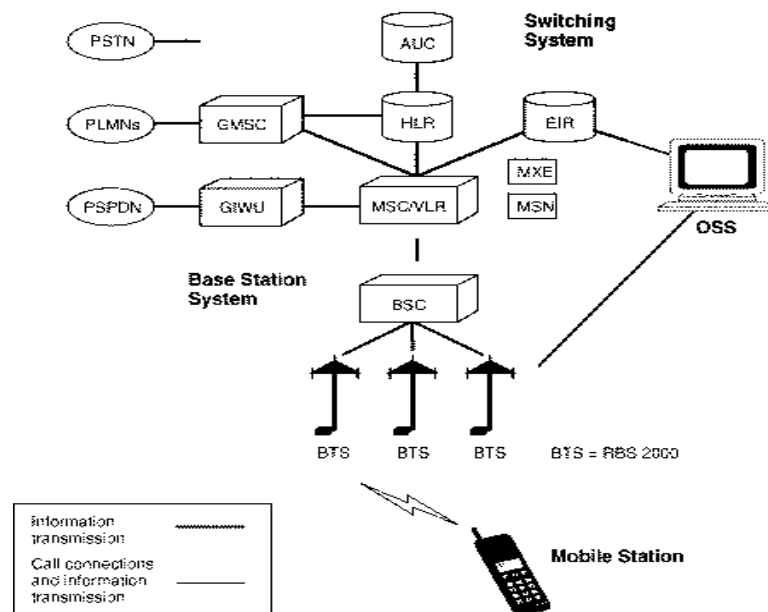


Figure 1.4: Architecture of a GSM network

### Mobile Station

The mobile station (MS) consists of the mobile equipment (the terminal) and a smart card called the Subscriber Identity Module (SIM).

The SIM card contains the International Mobile Subscriber Identity (IMSI) used to identify the subscriber to the system, a secret key for authentication, and other information. The IMEI and the IMSI are independent, thereby allowing personal mobility. The SIM card may be protected against unauthorized use by a password or personal identity number.

### Base Station Subsystem

The Base Station Subsystem is composed of two parts, the Base Transceiver Station (BTS) and the Base Station Controller (BSC).

These communicate across the standardized Abis interface, allowing (as in the rest of the system) operation between components made by different suppliers.

The Base Transceiver Station houses the radio transceivers that define a cell and handles the radio-link protocols with the Mobile Station.

The Base Station Controller manages the radio resources for one or more BTS. It handles radio-channel setup, frequency hopping, and handovers. The BSC is the connection between the mobile station and the Mobile service Switching Centre (MSC).

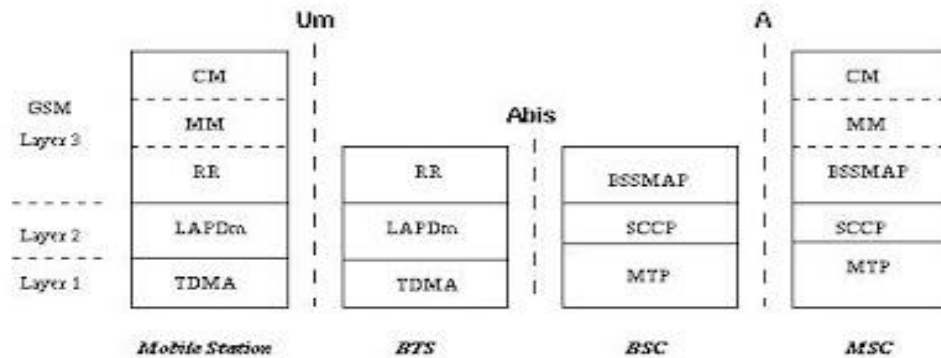
### Network Subsystem

The central component of the Network Subsystem is the Mobile services Switching Centre (MSC). It acts like a normal switching mode of the PSTN or ISDN, and additionally provides all the functionality needed to handle a mobile subscriber, such as registration, authentication, location updating, handovers, and call routing to a roaming subscriber. These services are provided in conjunction with several functional entities, which together form the Network Subsystem.

This simplifies the signalling required. MSC contains no information about particular mobile stations. This information is stored in the location registers.

### 1.2.5 Network Aspects

Ensuring the transmission of voice or data of a given quality over the radio link is only part of the function of a cellular mobile network. A GSM mobile can seamlessly roam nationally and internationally, which requires that registration, authentication, call routing and location updating functions exist and are standardized in GSM networks. In addition, the fact that the geographical area covered by the network is divided into cells necessitates the implementation of a handover mechanism. These functions are performed by the Network Subsystem, mainly using the Mobile Application Part (MAP) built on top of the Signalling System No. 7 protocol.



**Figure 1.5:** Signalling protocol structure in GSM

The signalling protocol in GSM is structured into three general layers, depending on the interface. Layer 1 is the physical layer, which uses the channel structures discussed above over the air interface. Layer 2 is the data link layer. Across the Um interface, the data link layer is a modified version of the LAPD protocol used in ISDN, called LAFDm. Across the A interface, the Message Transfer Part layer 2 of Signalling System Number 7 is used. Layer 3 of the GSM signalling protocol is itself divided into 3 sublayers.

#### Radio Resources Management

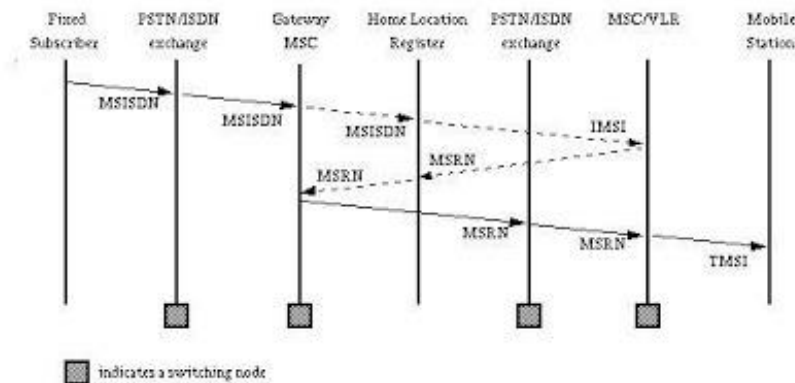
Controls the setup, maintenance, and termination of radio and fixed channels, including handovers.

## Mobility Management

Manages the location updating and registration procedures, as well as security and authenticity.

## Connection Management

Handles general call control, similar to CCITT Recommendation Q.931, and manages Supplementary Services and the Short Message Service. Signalling between the different entities in the fixed part of the network, such as between the HLR and VLR, is accomplished throughout the Mobile Application Part (MAP).



**Figure 1.6:** Call routing for a mobile terminating call

### **1.2.6 Frequency hopping**

The mobile station already has to be frequency agile, meaning it can move between transmitter, receiver, and monitor time slot within one TDMA frame, which normally are on different frequencies. GSM makes use of this inherent frequency agility to implement slow frequency hopping, where the mobile and BTS transmit each TDMA frame on a different carrier frequency. The frequency hopping algorithm is broadcast on the Broadcast Control Channel. Since multipath fading is dependent on carrier frequency, slow frequency hopping helps alleviate the problem.

## 1.3 GPS TECHNOLOGY

Any system that can provide intelligent vehicle location and navigation information will let us avoid congested freeways and find more efficient routes to our destinations, saving millions of euros in gasoline and tons of air pollution. Travel aboard ships and aircrafts will be safer in all weather conditions. Businesses with large numbers of outside plants (e.g., railroads and utilities) will be able to manage their resources more efficiently, reducing consumer costs. A Global Positioning System (GPS) provides the answer to facilitate all these issues.

A GPS is a space-based radio positioning system that combines computer mapping techniques to provide 24-hour three-dimensional position, velocity, and time information to suitably equipped users anywhere on or near the surface of the earth (and sometimes off the earth). It is an important tool for map-making and land surveying and has become a vital global utility, which is indispensable for modern navigation on land, sea, and air. A GPS is basically divided into 3 major components. These are the user segment, the control segment, and the space segment.

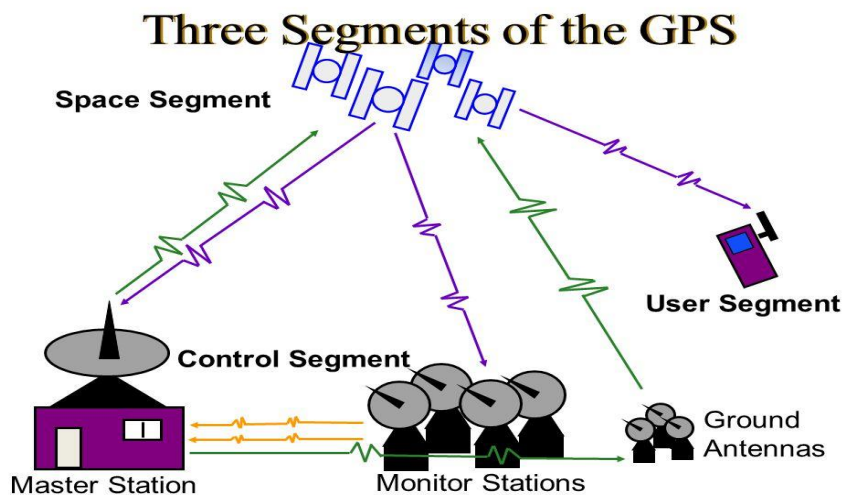
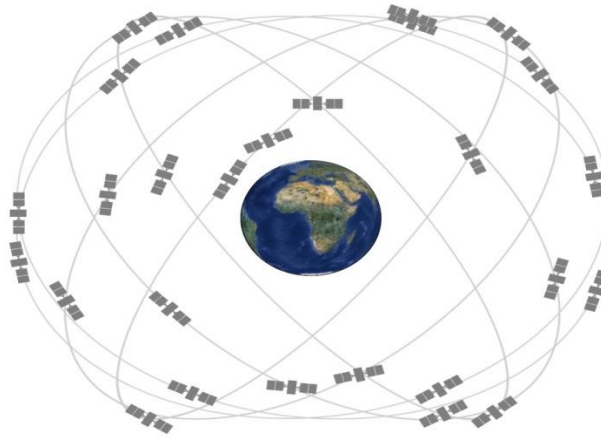


Figure 1.7: Segments of GPS

### The Space Segment

The space segment is composed of the GPS satellites<sup>1</sup> that transmit time and position in the form of radio signals to the user. The whole set of 24 satellites is called a



**Figure 1.8:** Constellation

Constellation. The GPS constellation is arranged in 6 equally spaced orbital planes. Each of these planes thus consists of 4 satellites and is inclined at 55 degrees to the equator. In this configuration, there is worldwide coverage since at least four satellites are available from any location on the earth's surface at all times.

#### The Control Segment

The control segment is composed of all the ground-based facilities that are used to monitor and control the satellites. This segment is usually not observed by the user. This part of the system consists of tracking and uplink stations located around the world and a master control station located in Colorado, USA. These monitoring stations measure signals from the satellites, which are incorporated into orbital models for each satellite.

#### The User Segment

The user segment consists of the users and GPS receivers. A GPS receiver is a specialized radio receiver designed to listen to the radio signals being transmitted from the satellites. This process requires four satellites to compute the four dimensions: X, Y, Z (position), and time.

GPS has three main functions: navigation (for aircrafts, cars, ships, etc.), precise positioning (e.g., for surveying) and time and frequency dissemination (e.g., for telecommunications facilities).

### **1.3.1 GPS Services**

GPS satellites provide service to civilian and military users. The civilian service is freely available to all users on a continuous, worldwide basis

#### Augmentation Systems

A GPS augmentation is any system that aids GPS by providing accuracy, integrity, availability, or any other improvement to positioning, navigation, and timing that is not inherently part of GPS itself.

NDGPS is a ground-based augmentation system that provides increased accuracy and integrity of GPS information to users.

WAAS, a satellite-based augmentation system operated by the Federal Aviation Administration (FAA), supports aircraft navigation.

GDGPS is a high accuracy GPS augmentation system, to support the real-time positioning, timing, and determination.

IGS is a network of over 350 GPS monitoring stations from 200 contributing organizations in 80 countries. Its mission is to provide the highest quality data and products as the standard for global navigation satellite systems.

### **1.3.2 Application of GPS**

#### Car Navigation

The most well-known commercial use of GPS is in car navigation systems. Before commencing a trip, a car driver just needs to feed in his destination in the GPS receiver's screen.

The car GPS navigation system makes you find your way easily and quickly. While driving on an unfamiliar road or being caught by heavy traffic, the most convenient and fastest way to get to your destination is to use a GPS system.

#### Dynamic Vehicle Routing

Dynamic vehicle routing is seen in, for example, courier services (such as DHL) that have mini-vans, which go around a city collecting parcels and express packages. A central computer or human scheduler carries out the processing of each request and decides which mini-van is selected to handle the request.

### Tracking Rental Cars

Some car rental companies have installed GPS tracking on their rental cars to monitor mileage, speed, and location of their cars. These companies have levied heavy surcharges on customers who were found to be speeding or going outside the area covered by the lease agreement. This type of monitoring has been challenged, because the vehicle monitoring practices are usually not clearly explained to customers. In this sense it is clear that the rental companies are interfering with their customers' privacy.

### Tracking Convicted/Suspected Criminals

GPS to aid in a conviction or an investigation has been challenged by defendants as an infringement of their privacy.

### Appealing Speed Tickets

A few individuals cited for speeding have produced GPS tracking information from their on-board GPS to appeal their ticket. Causes for this error could be that the police officer stopped the wrong car or his radar was malfunctioning.



## CHAPTER 2

### HARDWARE DESCRIPTION

#### 2.1 POWER SUPPLY

##### 2.1.1 Description

Initial stage of every electronic circuit is power supply system which provides required power to drive the whole system. The specification of power supply depends on the power requirement and this requirement is determined by its rating. The power supply provides 5V DC power to the circuit. The LM7805 linear voltage regulator circuit is used for controlled power supply.

##### 2.1.2 Features

- Output current upto 1A
- Output voltage of 5V
- Thermal Overload Protection
- Short Circuit Protection
- Output transistor Safe Operating Area Protection

##### 2.1.3 Circuit Diagram

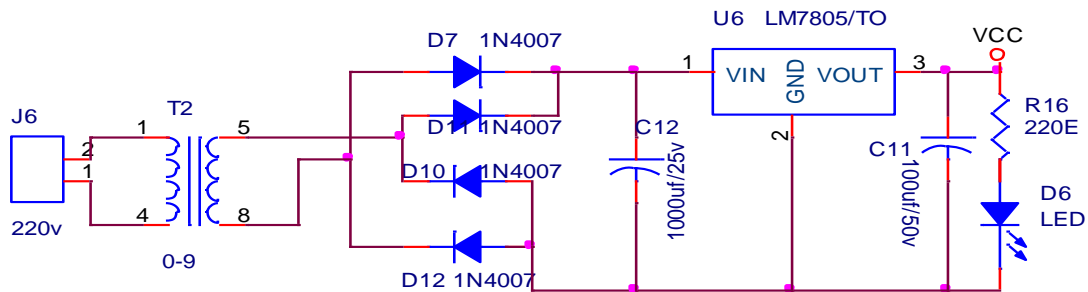


Figure 2.1: Circuit diagram of Power Supply

## 2.2 LM317

### 2.2.1 Description

This monolithic IC is an adjustable 3-terminal positive voltage regulator designed to supply more than 1.5 ampere of load current with an output voltage adjustable over a 1.2V to 37V. It employs internal current limiting, thermal shutdown and Safe Area Compensation.

In this project, the GSM Modem SIM808 requires 4.2V for operation. Rest of the components work at 5V. Since we were not able to find the battery of 4.2V with the desired current rating, we are using LM317 voltage regulator to provide supply to SIM808.

### 2.2.2 Features

- Output current in excess of 1.5A
- Output adjustable between 1.2V and 37V
- Internal Thermal Overload Protection
- Internal Short Circuit Current Limiting
- Output Transistor Safe Operating Area Compensation

### 2.2.3 Application

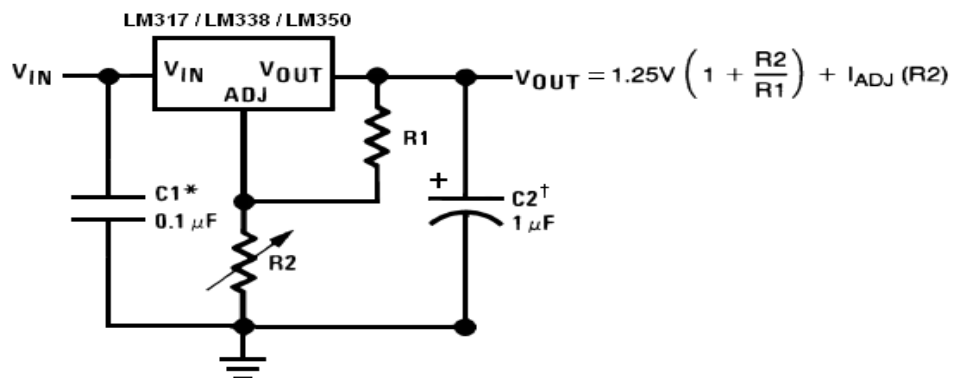
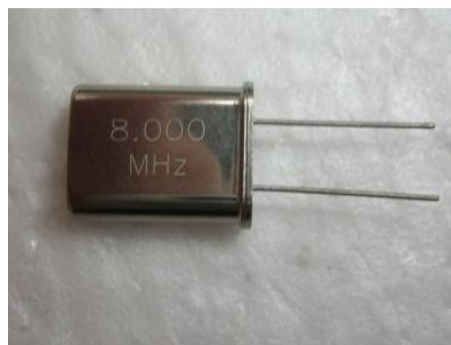
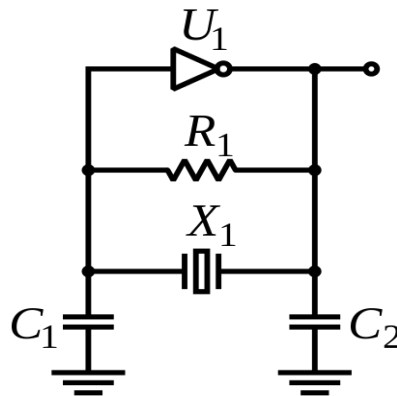


Figure 2.2:LM317 Circuit Application

- C1 is required when regulator is located at an appreciable distance from power supply filter.
- C2 is not needed for stability however it does improve transient response.
- Since  $I_{adj}$  is controlled to less than  $100\mu A$ , the error associated with the current is negligible.

## 2.3 CRYSTAL OSCILLATOR

It gives exact clock rates for most of the common baud rates for the UART, especially for higher speeds (9600, 19200). This gives the minimum crystal frequency possible for the desired baud rate. The frequency can be evenly multiplied to obtain higher clock speeds.



**Figure 2.3:** Crystal oscillator

## **2.4 MICROCONTROLLER: ATMEGA328**

### **2.4.1 Criteria to choose microcontroller**

- Firstly the microcontroller should meet the task at hand effectively.
- Speed- It should be the highest one that the microcontroller supports.
- Power consumption-This is especially critical for battery powered projects.
- The amount of RAM and ROM available on the chip.
- The amount of I/O pins and the timers available on the chip.
- The second criterion is how easy it is to develop products around it. Key considerations include the availability of assembler, debugger code compatible with C, emulator, technical support and both in house and outside expertise.
- The third criterion is ready availability of microcontroller in needed quantities at present and in future. For some designers it is even more important than first two.

Since ATMEGA328 satisfies all the above criterion so we have used it.

### **2.4.2 Description**

The Atmega328 is a very popular microcontroller chip produced by Atmel. It is an 8-bit microcontroller that has 32K of flash memory, 1K of EEPROM, and 2K of internal SRAM. Atmega328 has 32K of flash program memory and 2K of Internal SRAM. It has 28 pins. It has 14 digital I/O pins, of which 6 can be used as PWM outputs and 6 analog input pins.

### **2.4.3 Pin Description**

- Vcc: Digital supply voltage.
- GND: Ground.

- Port B (PB7:0) XTAL1/XTAL2/TOSC1/TOSC2

Port B is an 8-bit bi-directional I/O port with internal pull-up resistors (selected for each bit). The Port B output buffers have symmetrical drive characteristics with both high sink and source capability. As inputs, Port B pins that are externally pulled low will source current if the pull-up resistors are activated. The Port B pins are tri-stated when a reset condition becomes active, even if the clock is not running. Depending on the clock selection fuse settings, PB6 can be used as input to the inverting.

- Port C (PC5:0)

Port C is a 7-bit bi-directional I/O port with internal pull-up resistors (selected for each bit). The PC5.As inputs, Port C pins that are externally pulled low will source current if the pull-up resistors are activated. The Port C pins are tri-stated when a reset condition becomes active, even if the clock is not running.

- PC6/RESET

If the RSTDISBL Fuse is programmed, PC6 is used as an I/O pin. If the RSTDISBL Fuse is not programmed, PC6 is used as a Reset input.

A low level on this pin for longer than the minimum pulse length will generate a Reset, even if the clock is not running.

- Port D (PD7:0)

Port D is an 8-bit bi-directional I/O port with internal pull-up resistors (selected for each bit). The Port D output buffers have symmetrical drive characteristics with both high sink and source capability.As inputs, Port D pins that are externally pulled low will source current if the pull-up resistors are activated.

- AVcc

AVcc is the supply voltage pin for the A/D Converter, PC3:0, and ADC7:6. It should be externally connected to Vcc, even if the ADC is not used. If the ADC is used, it should be connected to VCC through a low-pass filter.

- Aref

Aref is the analog reference pin for the A/D Converter.

- ADC7:6 (TQFP and QFN/MLF Package Only)

In the TQFP and QFN/MLF package, ADC7:6 serve as analog inputs to the A/D converter.

#### 2.4.4 Pin diagram

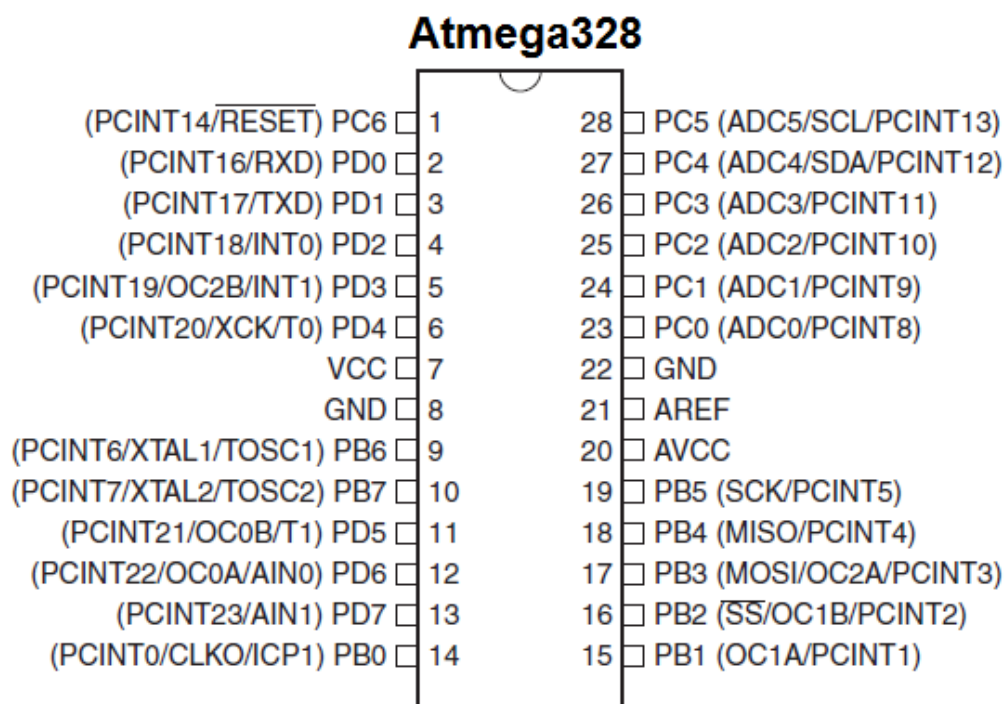


Figure 2.4: Pin out of ATmega328

## 2.5 ULN2803

### 2.5.1 Description

Most Chips operate with low level signals such as TTL, CMOS, PMOS, NMOS, which operate at the range of (0-5)V and are incapable to drive high power inductive loads.

### 2.5.2 Features

- Open–collector outputs.
- Output Current to 500 mA.
- Output Voltage to 50 V.
- Inputs pinned opposite outputs to simplify board layout.

### 2.5.3 Pin Diagram

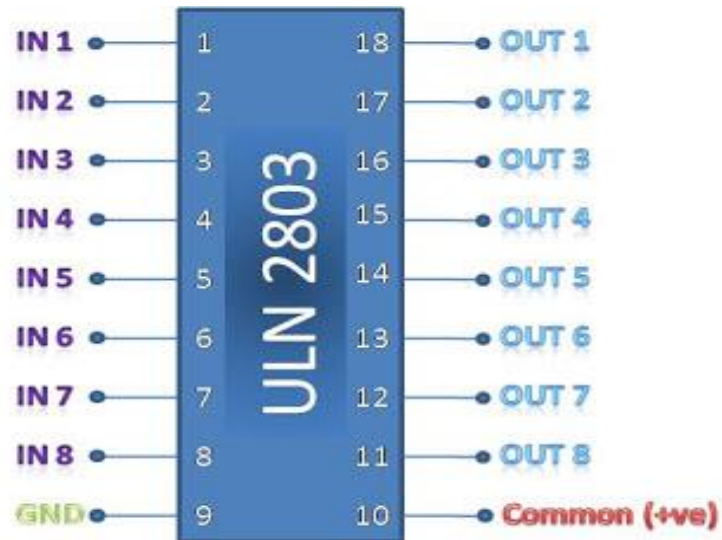


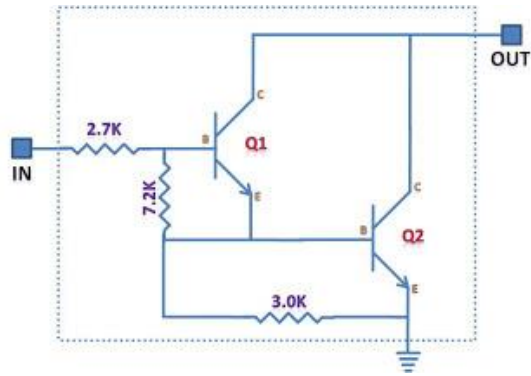
Figure 2.5: Pin out diagram of ULN2803

### 2.5.4 Working

The ULN 2803 IC consists of eight NPN connected transistors. This pair consists of two bipolar transistors such that the current amplified by the first is amplified further by the second to get a high current gain.

Case 1: When IN is 0 volts.

Q1 and Q2 both will not conduct as there is no base current provided to them. Thus, nothing will appear at the output (OUT).



**Figure 2.6:**Circuit of ULN 2803 IC.

Case 2: When IN is 5 volts.

When a 5V input is applied to any of the input pins (1 to 8), output voltage at corresponding output pin (11 to 18) drops down to zero providing GND for the external circuit. Thus, the external circuit gets grounded at one end while it is provided  $+V_{cc}$  at its other end. So, the circuit gets completed and starts operating.

## 2.6 SIM808 GSM-GPS MODEM

### 2.6.1 Description

Designed for global market, SIM808 is integrated with a high performance GSM/GPRS engine, a GPS engine and a BT engine. The GSM/GPRS engine is a quad-band GSM/GPRS module that works on frequencies GSM 850MHz, EGSM 900MHz, DCS 1800MHz and PCS 1900MHz.

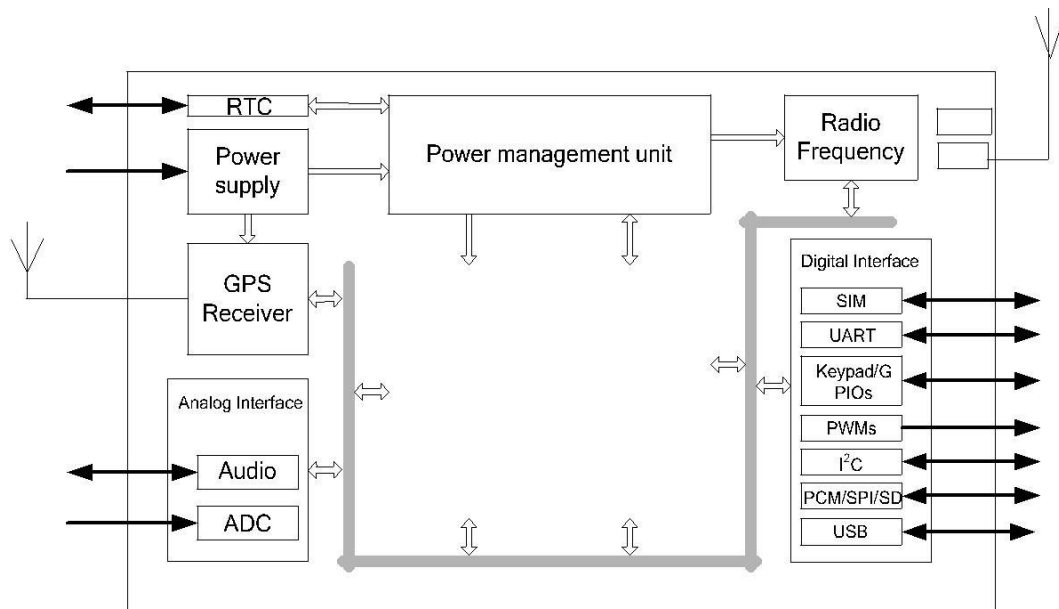
SIM808 is designed with power saving technique so that the current consumption is as low as 1mA in sleep mode (GPS engine is powered down). SIM808 integrates TCP/IP protocol and extended TCP/IP AT commands which are very useful for data transfer applications.



## 2.6.2 Key Features

- Feature Implementation
- Power supply 3.4V ~ 4.4V
- Power saving Typical power consumption in sleep mode is 1Ma
- Charging Supports charging control for Li-Ion battery
- Frequency bands SIM808 Quad-band: GSM 850, EGSM 900, DCS 1800, PCS 1900. It can search the 4 frequency bands automatically. It can be set by AT command “AT+CBAND”
- SMS MT, MO, CB, Text and PDU mode
- SIM interface Support SIM card: 1.8V, 3V
- Serial port Full modem interface with status and control lines, unbalanced, asynchronous. 1200bps to 115200bps.

## 2.6.3 Functional Diagram



**Figure 2.7:** SIM808 Functional Diagram

## 2.6.4 Pin Diagram

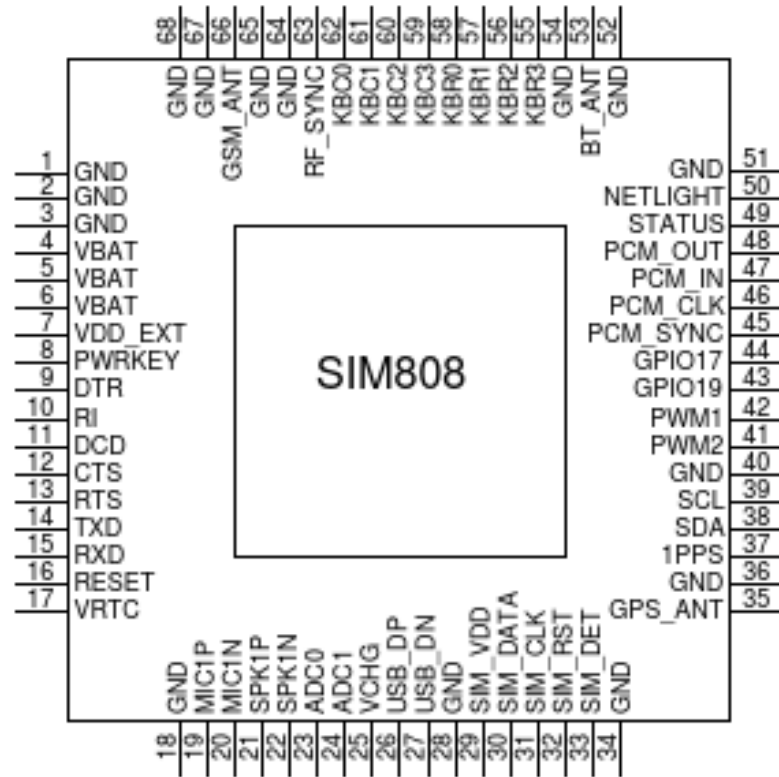


Figure 2.8: SIM808 Pin-out Diagram

## 2.6.5 Mode of Operation

- GSM/GPRS SLEEP

Module will automatically go into sleep mode if the conditions of sleep mode are enabling and there is no on air and no hardware interrupt (such as GPIO interrupt or data on serial port). In this case, the current consumption of module will reduce to the minimal level. In sleep mode, the module can still receive paging message and SMS.

- GSMIDLE

Software is active. Module registered to the GSM network, and the module is ready to communicate.

- GPRS STANDBY

Module is ready for GPRS data transfer, but no data is currently sent or

received. In this case, power consumption depends on network settings and GPRS configuration.

- **GPRSDATA**

There is GPRS data transfer (PPP or TCP or UDP) in progress. In this case, power consumption is related with network settings; uplink/downlink data rates and GPRS configuration.

- **POWER DOWN**

The power management unit shuts down the power supply for the baseband part of the module.

## **CHAPTER 3**

### **DESIGN STRUCTURE**

#### **3.1 WORKING**

Present project is designed using Arduinomicrocontroller, in this Project it is proposed to design an embedded system which is used for tracking and positioning of any vehicle by using Global Positioning System (GPS) and Global system for mobile communication (GSM).

In this project microcontroller is used for interfacing to various hardware peripherals. The current design is an embedded application, which will continuously monitor a moving Vehicle and report the status of the Vehicle on demand. For doing so microcontroller is interfaced serially to a GSM Modem and GPS Receiver.

A GSM modem is used to send the position (Latitude and Longitude) of the vehicle from a remote place. The GPS modem will continuously give the data i.e. the latitude and longitude indicating the position of the vehicle. The GPS modem gives many parameters as the output. The same data is sent to the mobile at the other end from where the position of the vehicle is demanded. An EEPROM is used to store the mobile number. The hardware interfaces to microcontroller are GSM modem and GPS Receiver.

The design uses RS-232 protocol for serial communication between the modems and the microcontroller. A serial driver IC is used for converting TTL voltage levels to RS-232 voltage levels. To avoid this kind of steal we are going to implement this project which provides more security to the vehicle. When the request by user is sent to the number at the modem, the system automatically sends a return reply to that mobile indicating the position of the vehicle in terms of latitude and longitude from this information we can track our vehicles.

### 3.2 BLOCK DIAGRAM

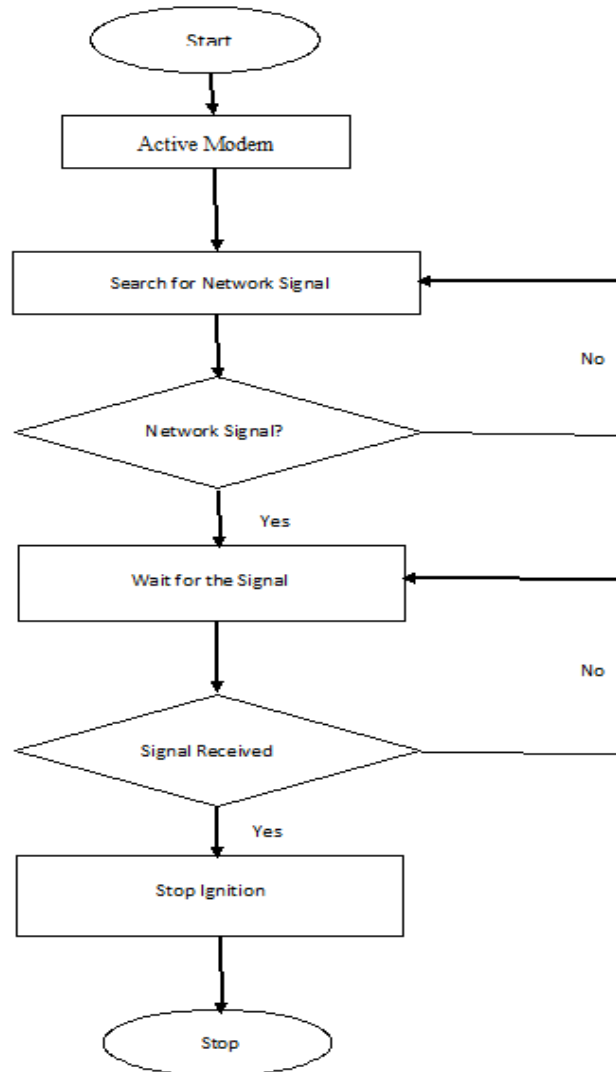
The diagram consists the power supply section, **SIM808 GSM GPRS Module**, microcontroller, MAX232driver, relay driver.The GSM board has a valid SIM card with a sufficient recharge amount to make outgoing messages. The circuits powered by +5v Dc.



**Figure 3.1**Block Diagram of the System

The circuit gets activated as the car gets stolen. The message is sent to the registered mobile number by the SIM card in GSM modem. GPS modem sends the location with latitudes and longitudes to the user's mobile number. The ignition is stopped when the user replies back to the GSM modem to stop the stolen car.

### 3.3 FLOWCHART



**Figure 3.2:** Flow chart of the antitheft system

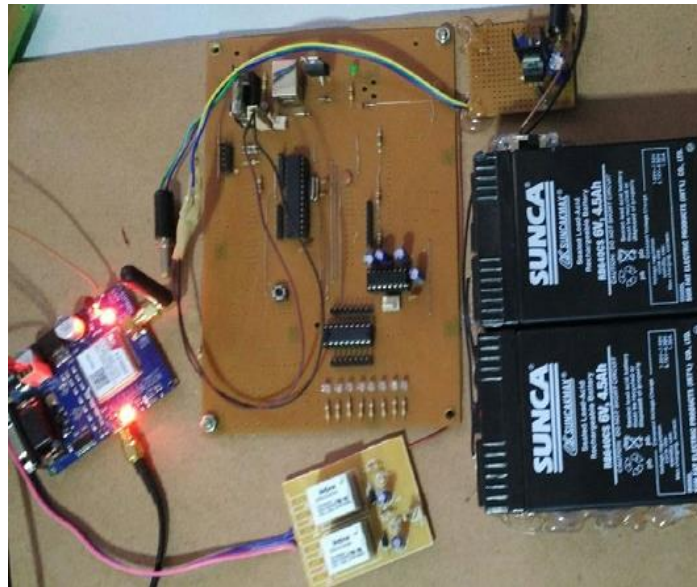
When the vehicle is started using some unfair means the modem gets activated. It starts searching for the signal. Once the signal is received it sends the SMS to the users' mobile stating the location of the car. Using the GPS antenna the latitude and the longitude of the current position of the vehicle is sent to the user. The user now sends the command to stop the ignition of the vehicle.

## CHAPTER 4

### RESULTS AND CONCLUSION

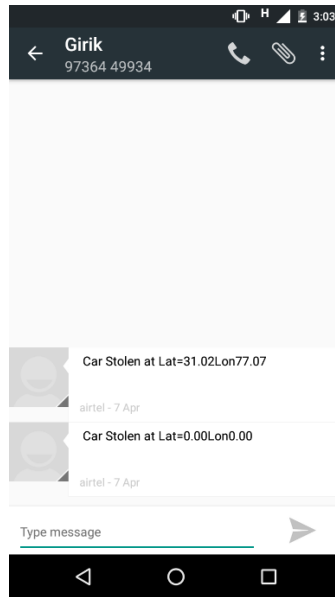
#### 4.1 RESULTS

When the system is powered up the antenna searches for the network signals. This is indicated by the flickering blue LED on the modem. Also we receive the message from the SIM card put up into the GSM module. This represents that the system is informing us of the car theft.



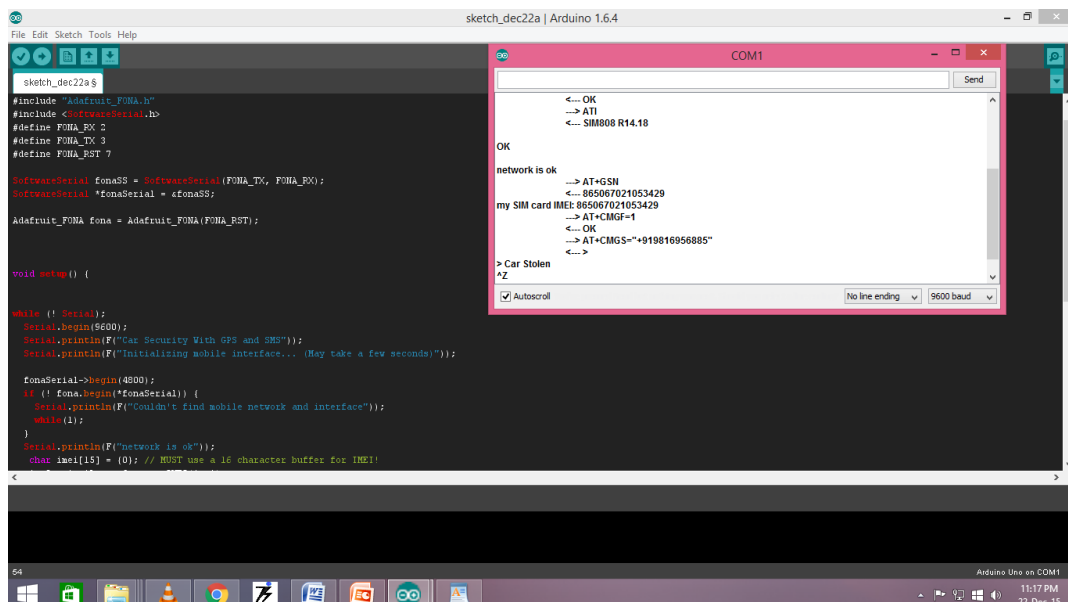
**Figure 4.1:** Hardware model

After that latitudes and longitudes of the stolen car is sent to the registered mobile number and the exact location of the car is known. This information can also be shared with the area Police station so that they can track down the car. Ignition of the system is also stopped by sending a message ‘LOCK’ from registered number to the GSM modem.



**Figure 4.2** Screenshot of User's Mobile

In this way, GPS location of the stolen car is sent to user's cell phone. Now this location can be used to find the exact address of the place by Using Google Maps.



**Figure 4.3:** IDE Terminal



IDE (Integrated Development Environment) is used for coding and the functioning of the system can also be seen on the terminal along with the latitudes and longitudes of the location.

## **4.2 CONCLUSION AND FUTURE SCOPE**

Vehicle tracking system is becoming increasingly important in large cities and it is more secured than other systems. This project deals with the design & development of a theft control system for an automobile, which is being used to prevent or control the theft of a vehicle. This system is designed to improve vehicle security and accessibility. The vehicle can be turned off by only with a simple SMS.

This setup can be made more interactive by adding a display to show some basic information about the vehicle and also add emergency numbers which can be used in case of emergency. Upgrading this setup is very easy which makes it open to future requirements without the need of rebuilding everything from scratch, which also makes it more efficient. With the use of wireless technology vehicle owners are able to enter as well as protect their automobiles with more passive involvement.

Ideally, this project could be made more convenient and secure with the use of satellite modems instead of cell phones as tracking device as the system may fail when there is no network coverage. This design can be made more enhanced in future to support camera, handset phone / hands free, mobile data LCD display, web based tracking software, and also PC based standalone software.

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