VEHICLE ANTI-THEFT AND CLOUD-BASED TRACKING SYSTEM

In the partial fulfillment of the requirement for the award of the degree of

Bachelor of Engineering in Electronics and Communication Engineering

Submitted by

ADDULA APURVA 160118735063

REGULAVALASA DEEPIKA 160118735066

BYREDDY JAHNAVI 160118735068

Under the Supervision of

Sir E.CHANDRASEKHAR

Assistant Professor

Dept. of ECE

Department of Electronics and Communication Engineering

Chaitanya Bharathi Institute of Technology

Hyderabad – 500075

Year 2021-2022

Declaration

We do declare that the project work "Vehicle Anti-theft and Cloud-Based Tracking System" submitted in the department of Electronics and Communication Engineering (ECE), Chaitanya Bharathi Institute of Technology, Hyderabad in fulfillment of degree for the award of Bachelor of Engineering is a bonafide work done by us, which was carried under the supervision of "Sir E.Chandrasekhar".

Also, We declare that the matter embedded in this report has not been submitted by us in full or partial thereof for the award of any degree/diploma of any other institution or University previously.

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Date:

DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

CHAITANYA BHARATHI INSTITUTE OF TECHNOLOGY(AUTONOMOUS)

HYDERABAD-500075

C E R T I F I C A T E

This is to certify that the Project work entitled "Vehicle Anti-theft and Cloud-Based Tracking System" is a bonafide work carried out by A.Apurva (160118735063), R.Deepika (160118735066) and B.Jahnavi (160118735067) in partial fulfillment of the requirements for the degree of Bachelor of Engineering in Electronics and Communication Engineering, Osmania University, Hyderabad during the academic year 2019-20. The results embodied in this report have not been submitted to any other University or Institution for the award of any diploma or degree.

Supervisor
Sir E.Chandrasekhar
Assistant Professor

Dr.D.Krishna Reddy
Professor and Head
Department of ECE

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ABSTRACT

Vehicle thefts result in a huge loss for automobile owners especially those who depend on them for their source of income. Most vehicles today have only theft alarms which can be easily disabled by thieves. An embedded vehicle anti-theft system can provide vehicles with better security thereby reducing the chances of robbery. Methods like image processing are for authentication and can be very time consuming. The existing vehicle theft alert systems have a user mode and a theft mode. Vehicle theft can only be detected in theft mode. If the owner forgets to switch on the theft mode they will not be notified of the theft. The authentication methods used do not enable the system to work in different possible situations. Also in the existing system, we can prevent the vehicle from getting stolen but we cannot catch the person responsible for the crime. The aim of this project is to design an anti-theft system that uses GSM (Global System for Mobile Communication) to alert the user of possible vehicle theft and receive the user's commands to initiate the required actions. Once a theft is detected, the vehicle's GPS (Global Positioning System) location will be tracked and sent to the user. The location will be visualized on Thingspeak. In Thingspeak the latitude and longitude measurements are used to determine the vehicle location and visualization can be observed in the form of a map. Thingspeak can be accessed on mobile. The user does not have to explicitly set the vehicle in theft mode.

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ABBREVIATIONS

S.No.	Abbreviation	Full Name
1	GSM	Global System for Mobile Communication
2	SIM	Subscriber Identity Module
3	GPS	Global Positioning System
4	IOT	Internet of Things
5	RFID	Radio-frequency Identification
6	OTP	One-time Password
7	M2M	Machine to Machine
8	DTR	Data Terminal Ready
9	RI	Ring Indicator
10	DCD	Data Carry Detect
11	CTS	Clear to Send
12	TXD	Transmit Data
13	RXD	Receive Data
14	SDA	Serial Data
15	SCC	Serial Clock
16	LED	Light Emitting Diode
17	GNSS	Global Navigation Satellite System
18	PNT	Position Navigation Timing
19	USB	Universal Serial Bus
20	SRAM	Static Random Access Memory
21	API	Application Programming Interface
22	GPRS	General Packet Radio Service
23	TCP	Transmission Control Protocol
24	RF	Radio Frequency

CHAPTER 1
INTRODUCTION

1.1 INTRODUCTION

In India in keeping with car robbery, housebreaking census from 2013,the car thefts are growing almost 8.47 %.The rate at which vehicle thefts occur every year is quite high.Since vehicles are a heavy investment,a huge loss occurs to the owners when their automobiles are stolen. On an average, for this case the generation to keep away from the robbery of the car needs to additionally be increased. Microcontrollers primarily based totally actual time car robbery detection and prevention gadgets offer answers for this problem. The Global gadget of cellular communication(GSM) is a globally well known for mobile communication.The car proprietor uses Subscriber Identity Module (SIM) inserted within his cellular telecel smartphone to ship messages to GSM modem and GPS gadget that's part of the car robbery prevention(gadget connected to car).The foremost scope of this venture is to ship an alert message to the proprietor of the car whilst the car is stolen.This venture consists of a GSM modem, GPS gadget ,microcontroller and we will be using the applications of IOT. When a person attempts to steal the automobile, the microcontroller receives interruption and orders GSM Modem to send the SMS.The owner gets an SMS that his vehicle is being stolen and also the precise location of the car through the GPS system.The user and theft mode concept in the existing system requires the user to explicitly set the vehicle in theft mode.This project aims to design a system that does not require the user to switch to theft mode in order for it to operate.

1.2 AIMS AND OBJECTIVES

Aim: To implement a system that detects vehicle theft,tracks the location of the vehicle using Thingspeak.
To fulfill above aim,following objectives are carried out

Objectives:

●To identify the limitation associated with existing vehicle anti-theft system through literature survey.

●To design an authentication system that detects vehicle theft.

●To notify the vehicle owner when an unauthorized user is identified and receive commands from the user using GSM.

●To design a central locking system that can be remotely controlled through SMS.

●To track the vehicle location and visualize it on Thingspeak.

1.3 MOTIVATION BEHIND THE PROJECT

The existing vehicle theft alert systems have a user mode and a theft mode. Vehicle theft can only be detected in theft mode. If the user forgets to switch on the theft mode they will not be notified of the theft. In this project we have designed an anti-theft system that uses GSM to alert the user of possible vehicle theft and GPS tracking based on the user commands. A GSM/GPRS module is used to sending the SMS alert and connect to the web server. The data will be visualized on MatLab Thingspeak. In Thingspeak the latitude and longitude measurements are used to determine vehicle location and the visualization can be observed in the form of a map.

1.4 LITERATURE SURVEY

The literature survey presents the work done by researchers within the area of our project and its comparison with various methods for theft detection. The subsequent papers discuss various aspects associated with the implementation and performance evaluation.

Champa Bhagavathi.R, Gowri.B.R, Kasturi.R, Pooja.C counseled of their paintings on " Vehicle Theft Detection and Prevention Using GSM & GPS", International Journal Innovative Research in Computer and Communication Engineering, vol.4, Issue 5, May 2016. The Proposed System includes Remote ignition cut-off and Vehicle monitoring modules. Both of them employ a GSM sub module. Vehicle monitoring module in addition uses GPS sub module and Remote ignition cut-off module makes use of password authentication sub module. User enters the correct password to begin the automobile. If a wrong password is entered 3 times, an auto-generated message is dispatched to the proprietor and a buzzer turns on alerting the close by personnel. GSM modem is used to ship OTP to the proprietor. The proprietor is likewise notified if his automobile is started. The proprietor can reply with an SMS. The ignition of the automobile will be disabled whenever the $OFF message is dispatched. GPS generation is used to tune the automobile. Location coordinates of the automobile are despatched to the proprietor whenever $LOC message is despatched.

Kunal Maurya , Mandeep Singh , Neelu Jain cautioned on their paintings on "Real Time Vehicle Tracking System the use of GSM & GPS Technology- An Anti-robbery Tracking System", International Journal of Electronics and Computer Science Engineering, vol.1, number3, 2015. This paper proposed to lay out a car monitoring device that works the use of GPS and GSM technology, which will be the most inexpensive supply of car monitoring and it might be painted as an anti theft device. It is an embedded device that is used for monitoring and positioning of any car via way of means of the use of GPS and GSM.

Maheshwari V.Chandravar,Shital Y. Gaikwad recommended their paintings on "Anti-Theft Security System Using GSM,GPS & RFID Technology primarily based totally on ARM7",International Journal of Engineering Research & Technology,vol.2,Issue 9,September 2013. The automobile is supplied with the RFID reader. The automobile is advanced with the aid of using the use of Direct cutting-edge motor which could be linked to the microcontroller the use of Motor Driver integrated circuit for growing the cutting-edge. The Door meeting is advanced the use of DC motor which could be managed the use of the relay. When the robbery is there, the door will lock automatically. When unauthorized humans need to open the door of a vehicle then he/she is not able to open without RFID tag.

.A Personal Use Vehicle Anti-Theft Tracking System Using IoT Platform by Department of Computer Engineering and IT Mandalay Technological University. In this paper, a vehicle anti-theft system has been implemented using a low-cost IoT platform. A GPS module connected to Arduino is used for theft detection. If the location by which the vehicle is changed without consent is more than the preset threshold then an alert is sent to the user through SMS. The vehicle location data is sent to the ThingsSpeak server over the internet by means of a GSM module. An Android application is used to access the server data and track the vehicle location using mobile. If GSM or GPS modules are not working properly an alert is sent to the user by SMS. (That is if the GSM module is not updating GPS data to the ThingSpeak server).

Detection of Automobile Theft and Engine Locking Using Arduino by Ayush K Sahai,Flory Francis, M.S. Ramaiah Institute of Technology, Karnataka, India. The methodology implemented in this paper uses RFID technology for the detection of vehicle theft. If a duplicate key is used to turn on the engine the user will be notified through SMS. The second division of the project involves engine locking and GPS tracking of the stolen vehicle. A cryptographic passkey is requested from the user

through SMS. When the user enters the correct passkey the engine will be locked. The vehicle's geographical coordinates are then sent to the user through SMS.

Vehicle Theft Detection By GSM by D.Gurunath, Dr Sreeja Mole S S, Rekha Department of ECE, CJITS, Janagaon. The theft detection methodology in this paper uses a vibration sensor. The amount of vibration detected is compared with the threshold set by the user. On detection of theft, a buzzer will be turned on. An SMS alert will be sent to user. The user can send an SMS back to disable the ignition. A relay is used to stop the 3 fuel flow thereby the engine gets locked. The system is implemented using an 8051 microcontroller, unlike most vehicle anti-theft systems that use Arduino.

1.6 ORGANIZATION OF THESIS

CHAPTER 1: Covers the introduction to the project, aim, objectives, motivation,and literature survey.

CHAPTER 2: Covers the introduction, specifications, pins, applications of GSM/GPRS Module

CHAPTER 3: Covers the introduction, specifications, interfacing, applications, features of GPS Tracking.

CHAPTER 4: Covers the Hardware and Software description of the project

CHAPTER 5: covers the step by step building of project

CHAPTER 6: The output results of the project have been shown with various screenshots taken.

CHAPTER 7: The conclusion of the project and what enhancements can be done in the future with this applications have been discussed

CHAPTER 2

GSM/GPRS MODULE

2.1 INTRODUCTION

GSM facilitates all communication between the user and system through SMS.This includes vehicle theft alert,user acknowledgement to the theft.After the theft is detected,the tracking of the vehicle location will be accessed in a web server(Thingspeak).Data cannot be sent over the internet using GSM.For this purpose,GPRS(General Packet Radio Service)is required. Data regarding the vehicle's GPS location is sent from the GPS module to the web server using GPRS.

2.2 GSM SIM900A MODULE

We are using GSM SIM900A in this project.SIM900A Modem is constructed with Dual Band GSM/GPRS based from SIMCOM.It is entitled to work on frequencies of 900/1800 hz.The AT commands can also set the frequency bands.The configurable baud rate is from 1200-115200 via AT command.Through the GPRS,the inner tcp/ip stack of the GSM can access the internet.SIM900A is an extremely compact and dependable wireless module. It is pretty suitable for SMS,voice and Data transfer applications in M2M interface.The complete GSM/GPRS module is an SMT kind and is designed with a completely effective single-chip processor integrating AMR926EJ-S core.The advantages can be from small dimensions and also cost-effective solutions will allow the benefits.

2.3 SPECIFICATIONS

- Dual-Band 900/ 1800 Hz
- GPRS multi-slot class 10/8GPRS mobile station class B
- Compliant to GSM phase 2/2+
- Dimensions of the modem: 24*24*3 mm
- Weight of the modem: 3.4g
- Control via AT commands -(GSM 07.07 ,07.05 and SIMCOM enhanced AT Commands)
- Supply voltage range of the modem: 5V
- Low power consumption: 1.5mA (sleep mode)
- Operation temperature: -40°C to +85 °

2.4 BLOCK DIAGRAM OF GSM SIM900A MODULE

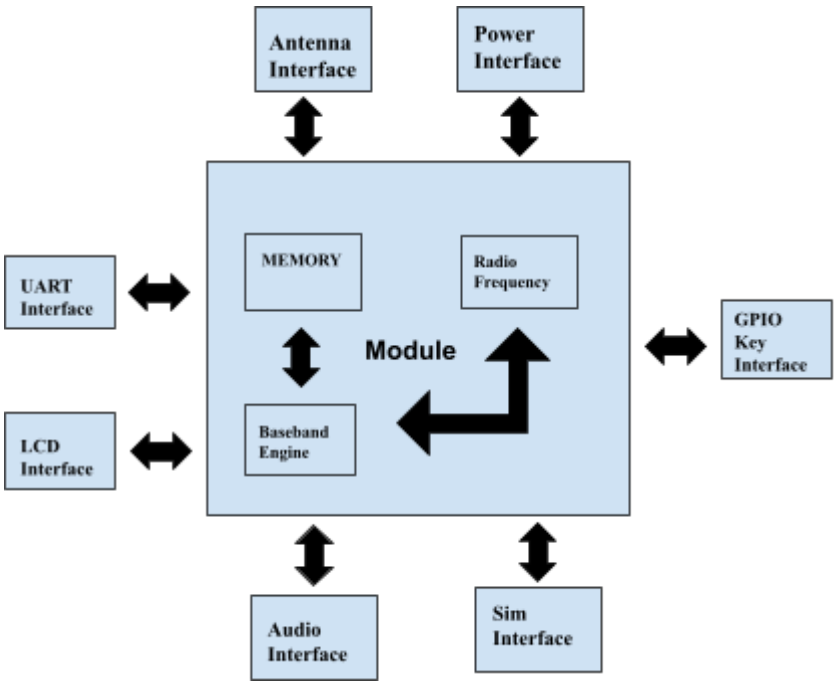


Fig 2.4.1 block diagram of internal structure of the module.

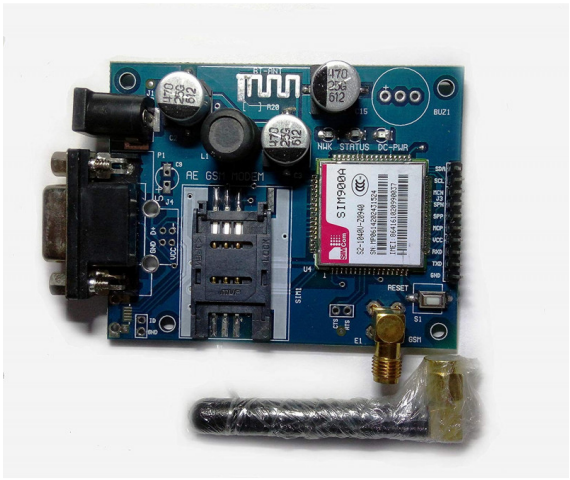


Fig 2.4.2 GSM SIM900A Module

2.5 GSM SIM900A MODULE PIN DESCRIPTION

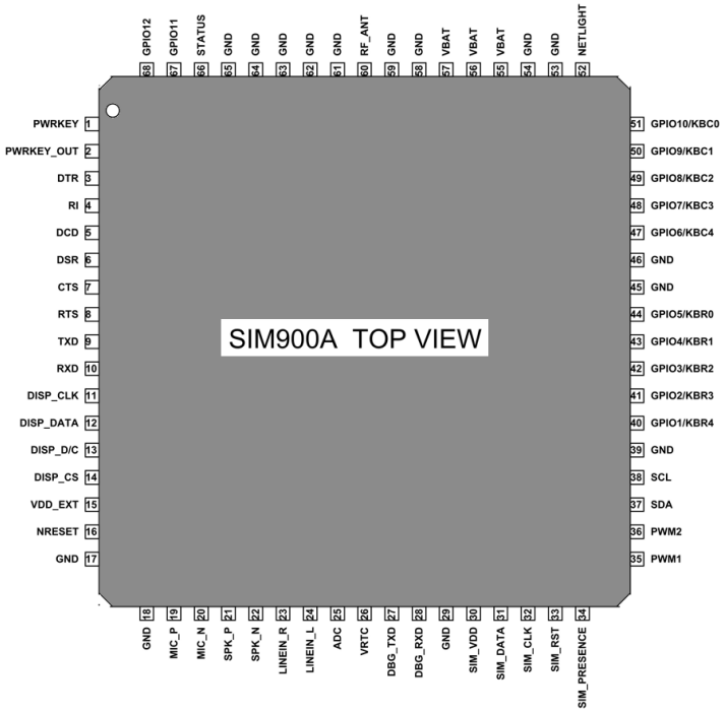


Fig 2.5.1 GSM SIM900A pin diagram of GSM SIM900A

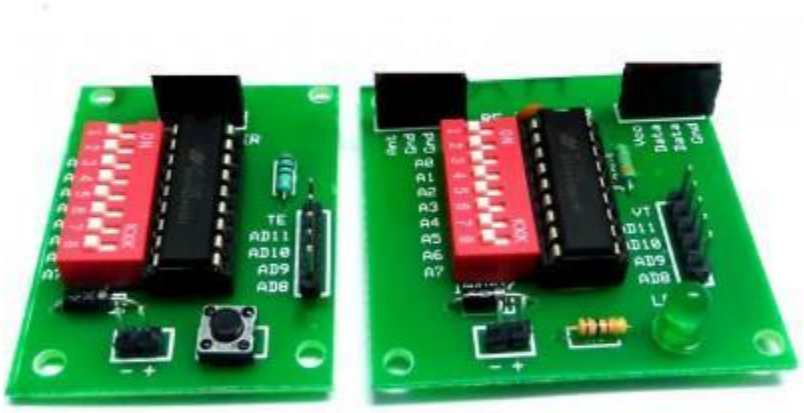
- Pin 1 and 2 are PWRKEY and PWRKEY_OUT.Voltage input is taken through PWRKEY and it should be low.Both PWRKEY and PWRKEY_OUT can be connected for sometime and then be released to power the module either on or off.
- Pin 3(DTR-Data terminal ready),pin 4(RI-Ring indicator),pin 5(DCD-Data carry detect),pin 6(DSR-Data Set Ready),pin 7(CTS-Clear to send),pin 8(RTS-Request to send),pin 9(TXD-Transmit data and pin 10(RXD-Receive data) are the 8 serial ports of the module.
- Pin 11(DISP_CLK),pin 12(DISP_DATA),pin 13(DISP_D/C) and pin 14(DISP_CS) are Display interface pins.
- Pin 15 is VDD_EXT,used for output power supply
- Pin 16 is NRESET
- The pins 17,18,29,39,45,46,53,54,58,59,61,62,63,64,65 are GND pins.
- Pin 19 (MIC_P) is Microphone Positive and pin 20(MIC_N) is Microphone Negative.
- Pins 21 and 22 are Speaker Positive(SPK_P) and Speaker Negative(SPK_N).
- We have the right channel and left channel input pins-pin 23(LINEIN_R) and pin 24(LINEIN_L).
- Pin 25 is the ADC pin which is used for analog to digital conversions.
- Pin 26 is the VRTC pin which is used for RTC input in the absence of a battery.
- The DBG_TXD(pin 27) and DBG_RXD(pin 28) are Transmit and Receive pins.
- SIM_VDD(pin 30) supplies voltage to the sim card.
- SIM_DATA(pin 31) is sim data output.
- Pin 32 is SIM_CLK(Sim Clock) and Pin 33 is SIM_RST which is used for the sim reset.
- SIM_PRESENCE(pin 34) detects the sim.
- PWM1(pin 35) and PWM2(pin 36) are the PWM outputs
- Pin 37 is SDA(Serial Data).

- Pin 38 is SCL(Serial clock).
- Pins 40,41,42,43,44 and 47,48,49,50,51 are keypad interfaces in terms of rows and columns.They are labeled as KBR0 to KBR4 and KBC4 to KBC0.
- Pin 52,NETLIGHT indicated the status of the net.
- Pin 55,56,57 are VBAT.These are used for connecting the supply voltage.
- Pin 60 is RF_ANT which is used for the antenna connection.
- Pin 66(STATUS) indicates the working status .
- We have two General purpose input/output pins as pin 67(GPIO 11) and pin 68(GPIO 12)

2.6 VEHICLE CENTRAL LOCKING USING RF (RADIO FREQUENCY) MODULE

- We can Monitor the status of the central locking system of the vehicle.
- We can see if its doors are locked or unlocked.
- The vehicle central locking system comprises relays which are controlled by a DC motor.
- In Thingspeak, the position of the relays can be monitored. The user will know if the doors are locked or unlocked.
- Car keys that control the car central lock are based on the RF module.
- A coder is present in the ignition key and a transmitter will be there for transmission of the modulated signals either in radio frequency or in light frequency.
- There will be corresponding receivers on the vehicle to drive a decoder which will also control a processor for the operations of the central locking.
- Transmission of the coded array will be done several times. At the set count, the detection system will be activated. A vehicle is equipped with common coders/decoders and selected transmission frequency.

- A central locking system is very secure and cost effective. It is a common system for selected transmission.



2.6.1 RF Encoder Decoder Module

2.7 FEATURES OF THE GSM SIM900A MODULE

- Input supply range can be from 3.4V to 4.5V.
- Operating frequency is EGSM900 and DCS1800.
- It has a configurable baud rate.
- Data Transfer Link-Download: 85.6kbps, Upload:42.8kbps.
- RS232 interface for direct communication with the computer and MCU kit.
- TCP/IP protocol stack is inbuilt for data transmissions over the internet through GPRS.
- Network status LED is built in.
- Antenna support is available.

- Audio input and output is also provided.
- Serial ports I2C and UART are present.
- Serial debug port is also present.
- It is a high quality product.

2.8 APPLICATIONS OF GSM SIM900A MODULE

- This module can be used for mobile communications.
- Can be used in home automations.
- For sensor monitoring.
- Can be used in security based projects.
- The field of robotics uses these modules widely.
- This module is exceptional in sms applications and voice calls.
- IOT applications,in terms of emergency use these modules.
- Can be used in servers , computer peripherals and USB dongles.

CHAPTER 3

GPS TRACKING

3.1 INTRODUCTION

GPS is a satellite based worldwide navigation system that uses GNSS network for tracking objects.This system consists of 24 orbiting satellites.These satellites are placed in 6 different orbital paths.Under 24 hours,due to the constant movement,the satellites complete 2 whole orbits around the Earth.The satellites communicate with the GPS module using microwave signals.

The GPS module is responsible for providing the users with positioning,navigation and timing (PNT services).

This system contains three segments-The Space Segment, Control Segment and The User segment.Space segment consist the constellation of the 24 satellites which transmit one way signals to give current GPS satellite position and time.The Control segment consists of the Monitor and the control stations to maintain the satellites in their orbits through commands and to adjust their clocks.The health and the status of the satellite is also maintained.The GPS satellites are tracked and the navigational data is uploaded.In the User Segment,we have the GPS Receiver equipment to receive signals from the satellites.The transmitted information is used for determining the user's 3-Dimensional position and the time.

In this project,the GPS module will send the coordinates of the vehicle to the Thingspeak application.The location of the vehicle on a satellite map can be visualized in Thingspeak.GTPA010 Module is used.

Fig 3.1.1 GPS Module

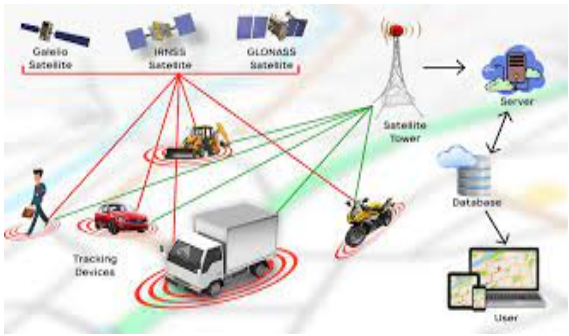


Fig 3.1.2 GPS Tracking

3.2 Specifications Of the GPS Module

- GPS satellites can transmit low energy radio signals, precise L1 and L2.
- L1 frequency of civilian GPS is 1575.42 MHz.
- The signals are commonly in line of sight with the levels expected of -140dBm.
- A GPS sign incorporates 3 exclusive bits of information — a pseudorandom code, ephemeris information and almanac information.
- Working temperature is -40 degree celsius to 85 degree celsius.
- UART and USB Interface.
- The GPS receiver is entitled to support 66 channels.
- NMEA0183 Protocol.

3.3 Interfacing GPS Module with Arduino

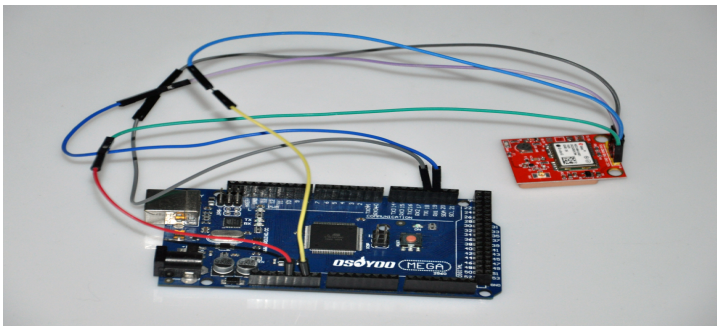


Fig 3.3.1 Interfacing of Arduino Mega 2560 and Neo 6M

Global Positioning System (GPS) uses alerts dispatched via way of means of satellites in area and floor stations on Earth to accurately decide its function.GPS receiver module makes use of USART conversation to talk with microcontroller or PC terminal from the satellites withinside the shape of NMEA string.The accuracy of the Arduino GPS is 2.5m GPS Horizontal Position Accuracy.

In this project, the Neo 6M GPS Module has to be interfaced with the Arduino Mega 2560.

- Connect the TX pin of GPS Module to pin number 4 of the Arduino board.
- Connect the RX pin of GPS Module to pin number 3 of the Arduino board.
- Connect the Red wire (5V pin) of the GPS module to the 5V pin of the Arduino board.
- Connect Black wire (GND pin) of the GPS Module to the GND pin of the Arduino board.
- The +5v from the power side of the Arduino board to any GND pin will add the GPS Module.
- Arduino pins 3 and 4 will work for the serial communication.

3.4 Features Of the GPS

- Real time tracking-Location of anything can be tracked through online in real time.
- GPS apps can be easily accessible on gadgets like,Ipad,etc.
- We can connect any SMS Gateway to GPSWOX PLATFORM.We can instantly get an SMS to our smartphones regarding important events like Vehicle speeding
- We can use the Points Of Interest tool to add markers at locations that we want at the time like fuel stations,hotels,etc.We can also name the place and add descriptions. Distance calculations between various places can also be done.
- Geofencing is possible.
- We can also check the vehicle tank's fuel level and consumption along the traveling route in real time.
- Aggressive driving behavior can also be checked to avoid accidents and to save more fuel.

3.5 Applications Of GPS Module

- In the field of aviation,the airlines need GPS.The real time position of the aircrafts can be known.Maps are also provided to reach the required destination..The fastest and safest route can also be inferred to.
- The military aircrafts apparently need GPS.
- In the same way,the marine navigation also uses GPS.The boat captains need it to navigate through the water channels.
- Farming uses GPS for many purposes.For activities like weeding and harvesting,GPS receivers are put on the farming equipment which helps in mapping the plantations.Suitable soil can also be located for farmers because of soil mapping.

- In Robotics,navigation of the mobile robots is enhanced through GPS.Fields like outdoor industrial work,agriculture can make use of it.
- The field of science uses GPS intensively for tracing.
- Can be used in telecommunications.
- Surveying uses GPS to determine various measures on both the Earth surface and underwater.
- Transportation needs GPS.
- Highway safety and congestion can be improved on combining GPS Technology with Intelligence Vehicle Highway systems.

There are innumerable applications for GPS Modules.

CHAPTER 4

HARDWARE AND SOFTWARE DESCRIPTION

HARDWARE DESCRIPTION

4.1.1 Block Diagram

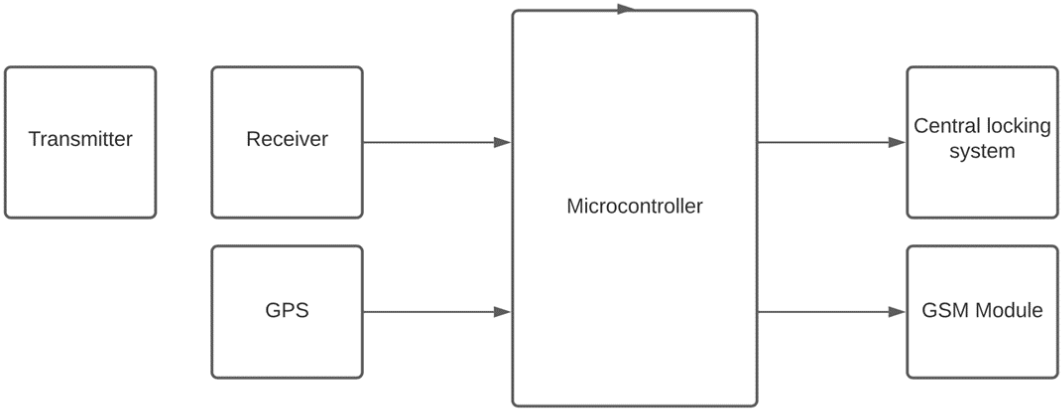


Fig 4.1.1 Hardware Block Diagram

The system consists of mainly Arduino microprocessors as the main unit, GSM module, GPS module.

4.1.2 Arduino Mega

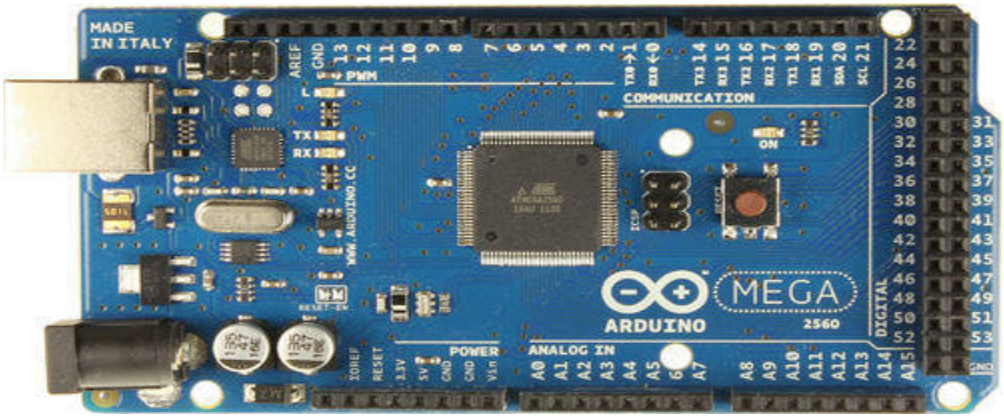


Fig 4.1.2 Arduino Mega

Arduino is an open-supply platform that offers each software program and hardware protocols to expand gadgets and layout digital initiatives that may engage with the actual world. Technically speaking, Arduino is a improvement board primarily based totally on a microcontroller, however, Arduino additionally refers back to the producers who expand those forums, and it additionally refers back to the network wherein experts, hobbyists, and like-minded human beings collaborate approximately well suited forums that paintings like Arduino forums.

Arduino Mega 2560 is an improved digital board primarily based totally at the Atmega2560 microcontroller. This board is a superb suit for tasks that require extra GPIO pins and reminiscence area as it incorporates sixteen analog pins and fifty four virtual I/O pins out of which 15 pins are used for PWM output. The board comes with a DC energy jack to energize this unit and you could additionally switch on the board the usage of a VIN pin at the board. The unit additionally helps a USB interface in which a USB cable is used to attach the board with the computer.

The Arduino Mega 2560 is much like Arduino UNO which comes with greater GPIO pins, greater reminiscence space, and is larger in size. The unit additionally helps the ICSP header that's used to software the board without disconnecting it from the principle circuitry. Two voltage regulators are covered at the board via which you may modify the voltage as you want better. Arduino Mega 2560 is programmed using the Arduino IDE software program. This is the reputable software program delivered through Arduino. The ATmega2560 controller at the board comes with 256 KB of flash reminiscence used for storing code (out of which eight KB is used for the Bootloader), at the same time as the SRAM is eight KB of SRAM and EEPROM is four KB of EEPROM.

4.1.3 Arduino Mega 2560 Pinout

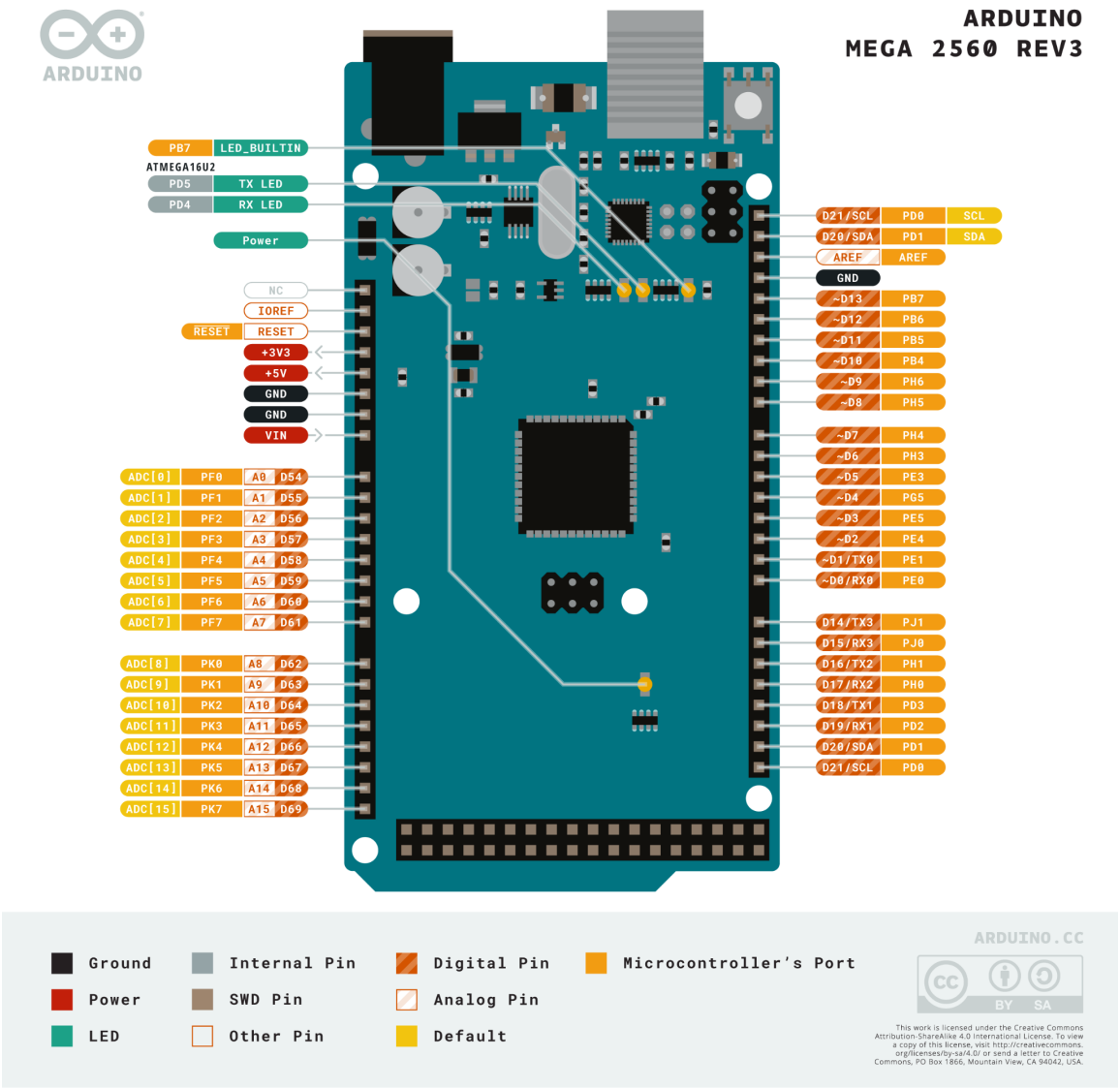


Fig 4.1.3 Arduino Mega 2560 Pinout

4.1.4 Arduino Mega 2560 Pin Description

Digital I/O Pins: There are overall of fifty four virtual I/O pins to be had at the board which may be used to attach the board with outside components.

PWM: 15 pins are used for PWM that's a manner used to manipulate the rate of the motor or brightness of the LED.

LED: This is the integrated LED linked to pin 13. When 5V is supplied to this pin, it'll flip ON the LED whilst floor or 0 V will flip it OFF.

Analogue Pins: There are sixteen analogue pins included at the board marked as A0 to A15. These pins can degree voltage from floor to 5V and every pin is a 10-bit decision pin.

GND: This board contains five floor pins that are used for initiatives in which a couple of floors is required.

External Interrupts: Six pins are reserved for producing outside interrupts. Those are pin variety 0, 3, 18, 19, 20 & 21.

Reset: This is the reset pin of the board. This pin is beneficial while your code gets caught withinside the center of the jogging program, urgent this pin will reset the code compiled into the board.

Vin: This is the enter voltage of the board which tiers from 6V to 12V, however, encouraged enter voltage tiers from 7V to 12V.

AREF: This is the analogue reference voltage that may be a reference voltage for the analogue inputs.

4.1.5 How to Program Arduino Mega 2560

Arduino Mega 2560 may be programmed in the usage of Arduino IDE software program that is a professional Arduino software program used for all application Arduino boards. This software program can be used for writing, compiling, and importing the code into the Arduino board.

This unit comes with a USB interface so a USB cable may be used to attach the tool with the pc through which you may switch sketch (Arduino application is referred to as a sketch) to the board. Moreover, this software program is open-supply this means that it's miles loose to apply and each person can use this software program to permit the board to paintings as consistent with the range of commands you ship from this software program to the Arduino board.This board consists of a integrated Bootloader this means that you don’t require an outside burner to burn the code into the Arduino tool.

4.2 GSM MODULE (SIM900A)

Fig 4.2.1 GSM Module(SIM900A)

This is a twin band GSM module that operates on frequencies b/w 900/1800 hz. This can be used to communicate with the controller using AT instructions. This module comes with RS232 interface that allows interface to PC and microcontroller. This module might be used for sending messages, deleting messages, making calls, etc. Some of the AT instructions are cited below.

Table no. 4.2.1 AT Commands and Functions of GSM Module

AT Command	Functions
+CMGS	Sending message
+CMSS	Sending message from the storage
+CMGW	Writing message to memory
+CMGC	Sending command
+CMMS	More messages to send
ATA	Used to answer the incoming calls

4.3 GPS MODULE

Fig 4.3.1 GPS Module

The GPS is a satellite tv for pc primarily based totally navigation gadget that gives vicinity and time information. The gadget is freely handy to everybody with a GPS receiver and unobstructed line of sight to at least 4 of GPS satellites. A GPS receiver calculates its functions via means of exactly timing the indicators dispatched via way of GPS satellite. GPS is these days broadly used and additionally has grown to be a critical part of clever phones.

The GTPA010 module is simple to use, having RS232 in addition to the USB interface. It operates over 3.2 to 5V deliver variety therefore permitting interfacing

with microcontrollers with 3.3V in addition to 5V. The module outputs GPS facts in NMEA0183 format. Each message string begins off evolving '$' after which the message identifier. Each parameter is separated by the use of a comma in order that the message may be parsed with the assistance of the commas.

4.4 TRANSMITTER

A transmitter is a digital tool utilized in telecommunications to supply radio waves on the way to transmit or ship information with the useful resources of an antenna. The transmitter is capable of generating a radio frequency alternating present day that is then implemented to the antenna, which, in turn, radiates this as radio waves. There are many varieties of transmitters relying on the usual getting used and the kind of tools; for example, many present day gadgets which have conversation competence have transmitters inclusive of Wi-Fi, Bluetooth, NFC and cellular. A transmitter is likewise known as a radio transmitter.

Transmitters are gadgets which might be used to ship out statistics as radio waves in a particular band of the electromagnetic spectrum so that you can satisfy a particular communique need, be it for voice or for prefered statistics . In order to do this, a transmitter takes strength from a strength supply and transforms this right into a radio frequency alternating contemporary that modification route hundreds of thousands to billions of instances in step with 2d relying at the band that the transmitter desires to ship in. When this unexpected converting strength is directed through a conductor, in this example an antenna, electromagnetic or radio waves are radiated outwards to be acquired through every other antenna that is linked to a receiver that reverses the system to give you with the real message or data.

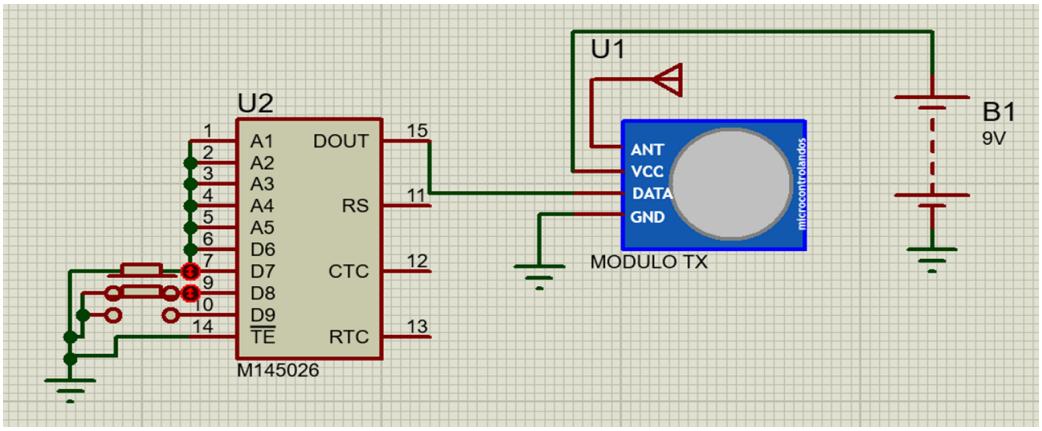


Fig 4.4.1 Transmitter

4.5 RECEIVER

Receiver, in electronics, any of numerous gadgets that receive signals, consisting of radio waves, and convert them (regularly with amplification) right into a beneficial form. Examples are cell phone receivers, which rework electric impulses into audio signals, and radio or tv receivers, which receive electromagnetic waves and convert them into sound or tv pictures.

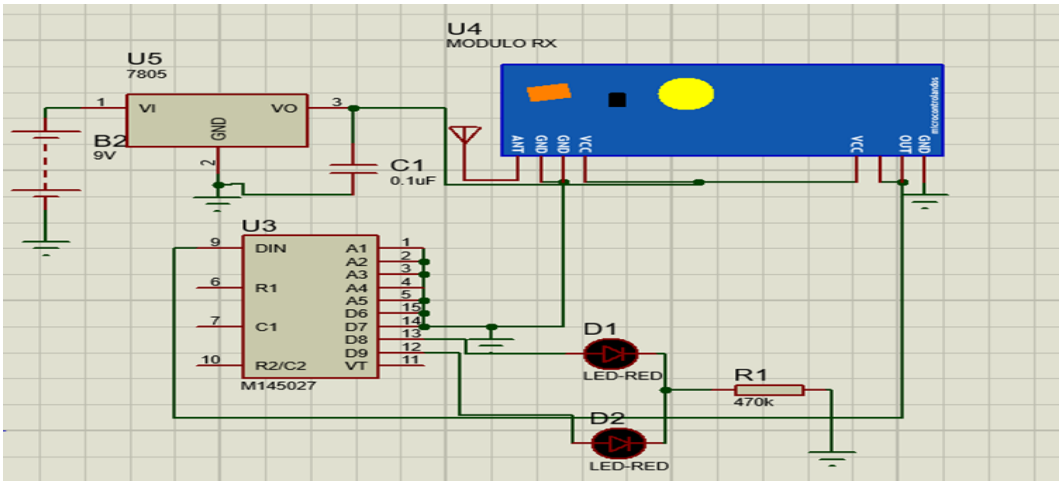


Fig 4.5.1 Receiver

SOFTWARE DESCRIPTION

4.6 THINGSPEAK SERVER

ThingSpeak server acts as an API for Internet based things.It is an open statistics platform.Thingspeak collects statistics.The data can be stored and visualised.The Visualizations given on ThingSpeak are very spontaneous.Thingspeak can execute MATLAB code.We can perform online evaluation and the statistics can also be processed with the server's capabilities.The ideal IoT structures which need analytics and that are to be prototyped can depend on ThingSpeak.Users on ThingSpeak can perform aggregation,then visualize and examine the statistics streams.These can be performed inside the cloud. Creating a ThingSpeak account and enabling a channel under it can be more tricky than to shop statistics on the server.

ThingSpeak is an IoT analytics platform service that helps you to accumulate and save sensor information withinside the cloud and expand Internet of Things (IoT) applications. ThingSpeak has an unfastened Web Service (REST API) that helps you to accumulate and save sensor information withinside the cloud and expand Internet of Things applications. It works with Arduino, Raspberry Pi, MATLAB and LabVIEW, Python, etc.

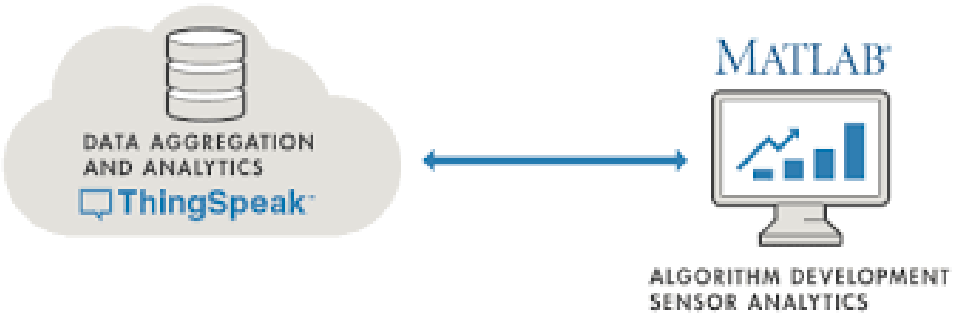


Fig 4.6.1 ThingSpeak

4.7 ARDUINO IDE

For the communique among the microcontroller and the modules and for sending and receiving automobile region information among the microcontroller and the server, the microcontroller and the modules are programmed through the Arduino IDE software. The Arduino incorporated improvement surroundings is a cross-platform utility for Windows, Mac OS, and Linux that is written in the programming language Java.

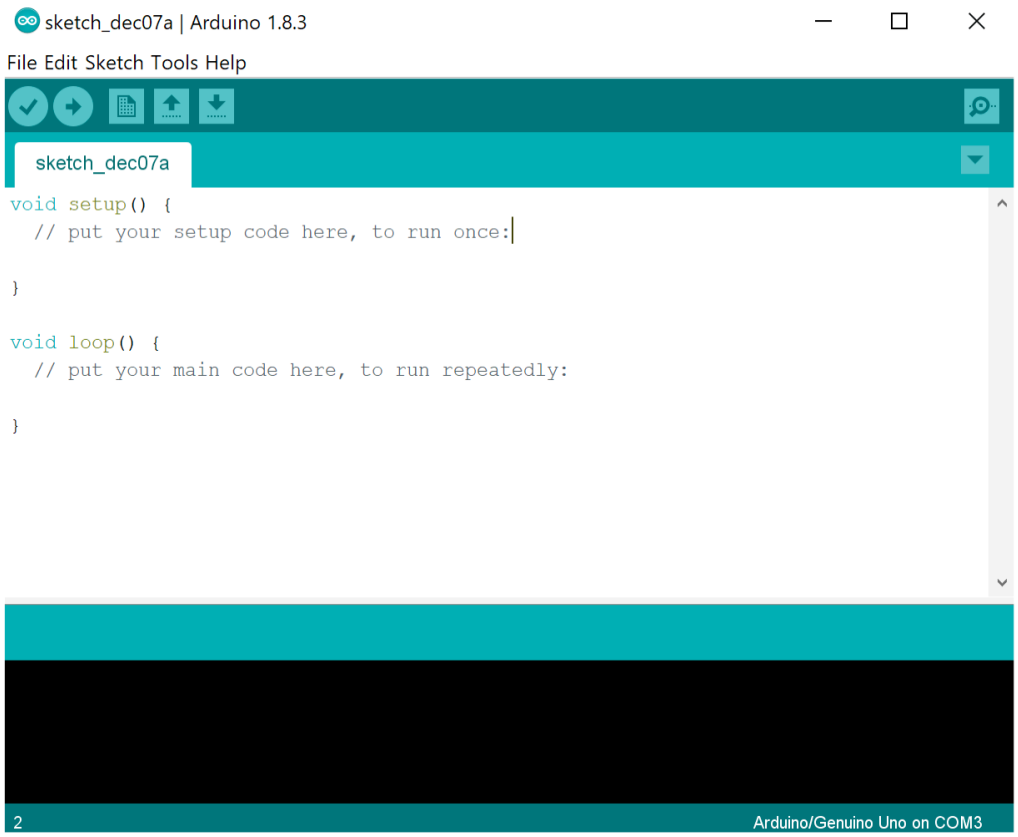


Fig 4.7.1 Arduino IDE

CHAPTER 5

BUILDING OF THE PROJECT

5.1 FUNCTION FLOW

In this proposed project, the robbery detection tool is located in the right role withinside our vehicle. After that, the GSM module of this tool will get initialized with the aid of activating the SIM card in the module and connecting it to the Internet over the GPRS. The energy delivered is given to make the tool paintings. The GPS and GSM modules are first off checked whether or not they're operating correctly or now no longer. The GPS module will now no longer paint if it no longer has the clean line of sight to satellites. Also, the GSM module will now no longer paint if its antenna can't acquire the right sign from a base station. If either one of the modules isn't operating properly, the device will ship the message with the aid of using SMS to the owner's cellular phone, mentioning that the module isn't operating properly.

When each module is operating properly, the GPS module will constantly get hold of the place data of the car from satellites so long as the electricity is on. The accumulated place data is despatched out from the transmission pin of the GPS to the reception pin of the microcontroller because the NMEA sentences. The NMEA sentences are parsed into beneficial values with the aid of the usage of the capabilities furnished in the TinyGPSPlus library. The parsing is honestly putting off the chunks of statistics from the NMEA sentences. The Arduino Mega microcontroller sends them to the ThingSpeak server each 15 seconds using the TCP/ IP protocol over the GPRS. The ThingSpeak server then collects the statistics in the ThingSpeak channel. The car place data consists of the latitude, the longitude, the speed, the quantity of detecting satellites, the accuracy, and the direction. The Android utility sends the URL to ThingSpeak server in conjunction with the ThingSpeak channel quantity and the API

key, fetches the place records from ThingSpeak server, and indicates the specified records of the modern-day place and the route records of the car on Google Map. Thus, the proprietor can track the car remotely in actual time.

Fig 5.1.1 Software Architecture

- Theft detection logic when unlock output is high it means the vehicle has been unlocked and theft is detected.

lockInput	unlockInput	unlockOutput
0	0	0
0	1	1
1	0	0
1	1	0

Table no 5.1.2 Theft detection logic

- When unlock output is high the alert is sent to mobile through SIM900A GSM module.
- Then a string is received from the mobile. Based on the string received the vehicle tracking starts.
- The vehicle is tracked using GPS and the location is sent to ThingSpeak.
- The live coordinates are visualized on ThingSpeak. The link to the ThingSpeak channel is sent to SMS and live location tracking is viewed on the

mobile.

5.2 DEVICE IMPLEMENTATION

The GPS module and the GSM module are related to the Arduino Mega microcontroller, wherein they have got the not unusual place ground. They are powered from the electricity financial institution or the battery. According to the datasheet of the Ublox GPS module, the most working modern-day is 40mA on the regular running condition. The GSM module wishes approximately 5 seconds in line with minute for transmitting records via means of spending 2 hundred mA, which might deliver 24 mA on average. The GSM module will take 50 mA. The DC modern-day in line with the I/O pin in Arduino Mega is 20 mA. By summing up the whole modern-day, the predicted modern-day drawn of the tool is 134 mA (= 40+24+50+20).The program for the system is written in C, and is uploaded to the Arduino Mega microcontroller by using a Arduino IDE

5.3 THINGSPEAK SERVER CONNECTION

In this system, the place records of the car are sent from the Arduino Mega microcontroller to the ThingSpeak. The TCP connection between microcontroller to ThingSpeak server is initiated via means of giving the host call and the port of ThingSpeak server, which will become viable via means of starting up the "AT+CIPSTART" command. When the GPRS is attached to the ThingSpeak server, the records have to be dispatched. Here, the latitude and longitude, the quantity of satellites, the speed, the accuracy, the direction, and the place message are dispatched to the ThingSpeak server. Since the records is saved withinside the fields of the channel of ThingSpeak server, the channel API key is likewise needed. The records is despatched withinside the String layout to ThingSpeak channel via way of means of the usage of the "AT+CIPSEND" command.

CHAPTER 6

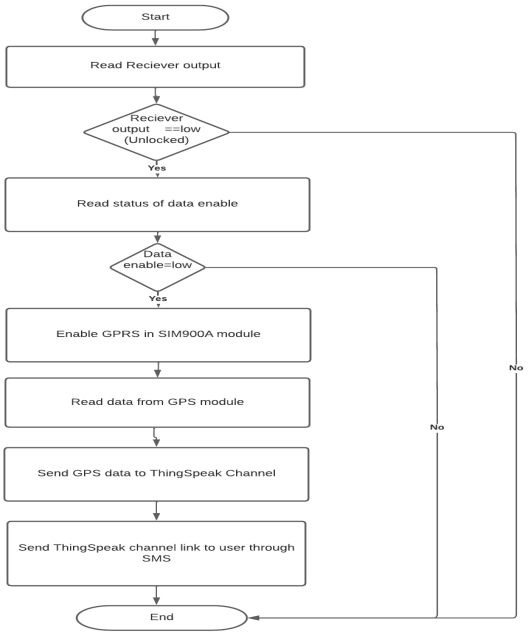
RESULTS AND DISCUSSIONS

6.1 INTRODUCTION

The switches on the transmitter are used to give the input. If the receiver reads unlock input then the theft alert is sent to the user mobile through SMS. At the same time the GPS tracking begins. The data collected by the NEO 6M GPS module is sent to the ThingSpeak server. This is done by using GPRS. The user receives the link to the ThingSpeak channel through SMS. The tracking of the vehicle is visualized in ThingSpeak. The coordinates of the vehicle are mapped graphically. The location is also viewed on a map visualization in ThingSpeak. The ThingSpeak channel is easily accessed on mobile. The central processing unit in the project is Arduino mega 2560.

Fig 6.1.1 Flowchart of working of project

6.2 THEFT DETECTION AND GSM ALERT



The objective of this project was to show how a automobile's central locking mechanism can be controlled to detect vehicle theft. For this we have modeled a vehicle central locking system using a radio frequency transmitter and receiver module. The input is given from the transmitter switches. Switch 2 of the transmitter is for lock input , switch 3 data enable and switch 4 is for unlock input. Initially all the switches are in the state HIGH. They are enabled when made LOW. When switch 2 is made LOW the system operates normally. When switch 4 is made LOW the theft alert and tracking begin. In order to send SMS data the data enable switch must also be made LOW else the user will not receive SMS alerts. Once the inputs are given by the transmitter, the receiver output is read by Arduino and the corresponding action takes place. The alert is sent to the user 's mobile through SMS with the help of GSM SIM900A module.

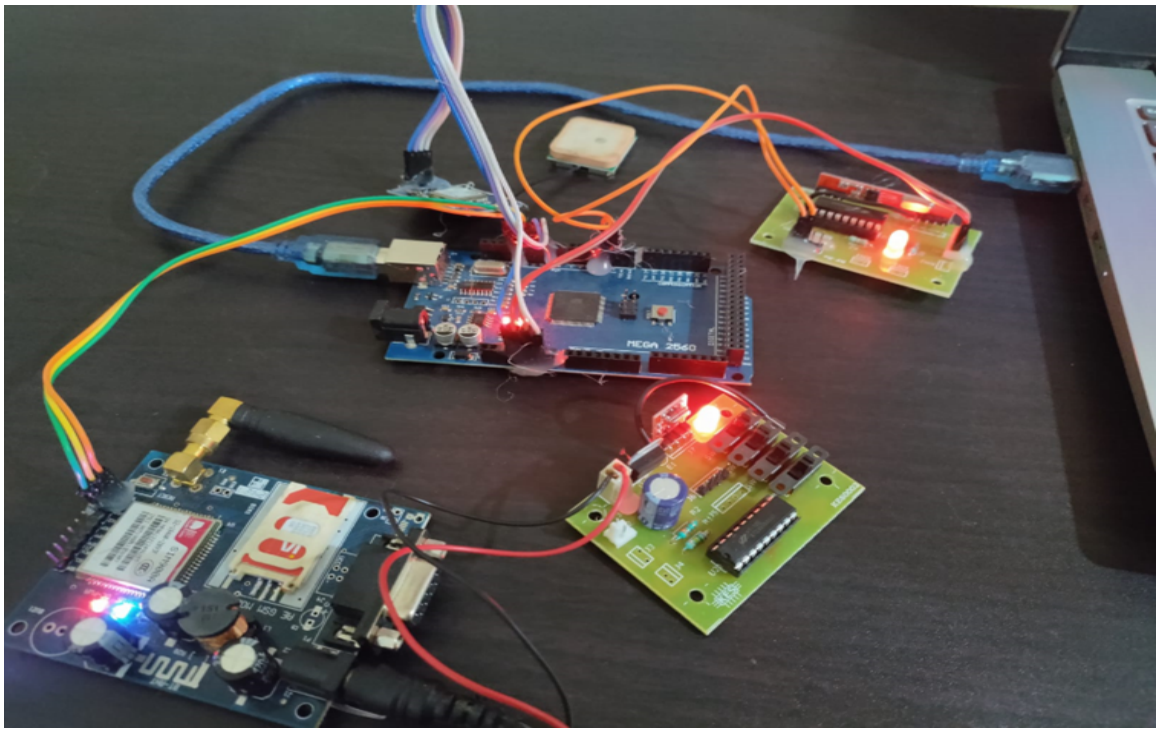


Fig 6.2.1 Prototype of the project

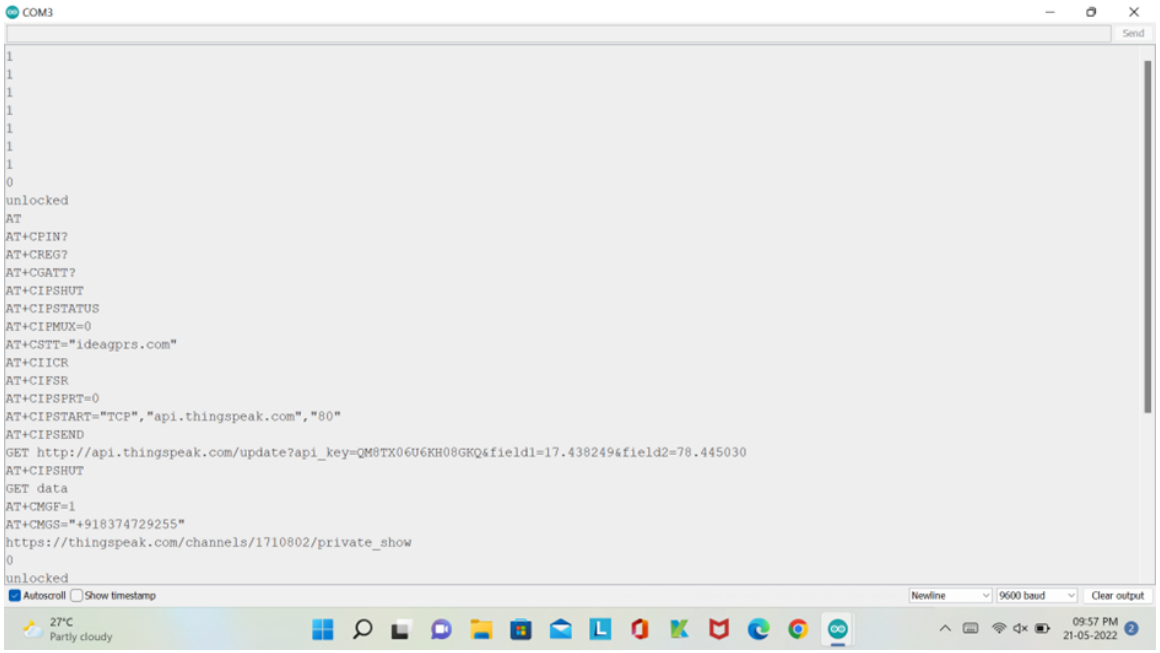


Fig 6.2.2 Serial monitor showing status of receiver output, GSM and GPRS connectivity

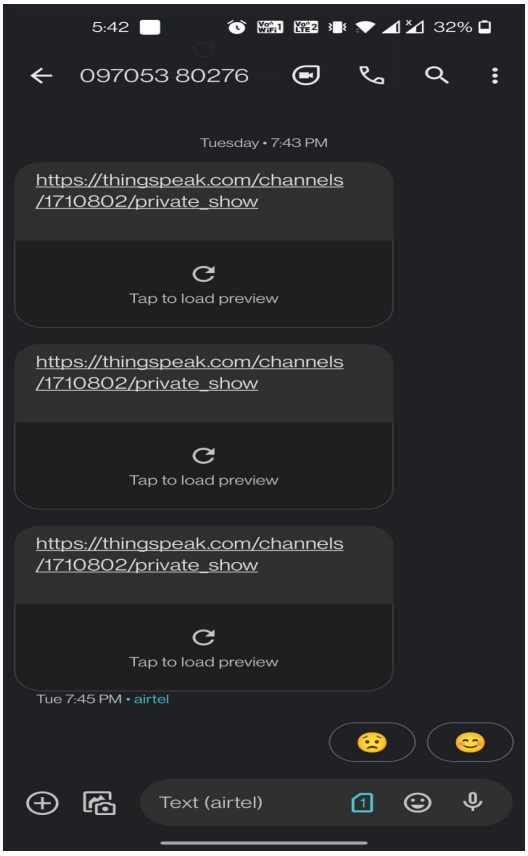


Fig 6.2.3. Theft alert SMS in owner mobile sent through GSM

6.3 GPS TRACKING AND VISUALIZATION IN THINGSPEAK

Once the theft is detected GPS tracking starts. The data collected from the GPS module is sent to ThingSpeak. The connection is established using GPRS functionality of the SIM900A module. The coordinates are instantly updated on the ThingSpeak server. The coordinates are viewed graphically and also on a map visualization. The coding for the map visualization in MATLAB has been done manually. The longitude and latitude of the vehicle at every point in time are graphically updated on the server. The location is thus tracked with high accuracy on the map as well. The channel can also be clearly viewed on mobile browsers.

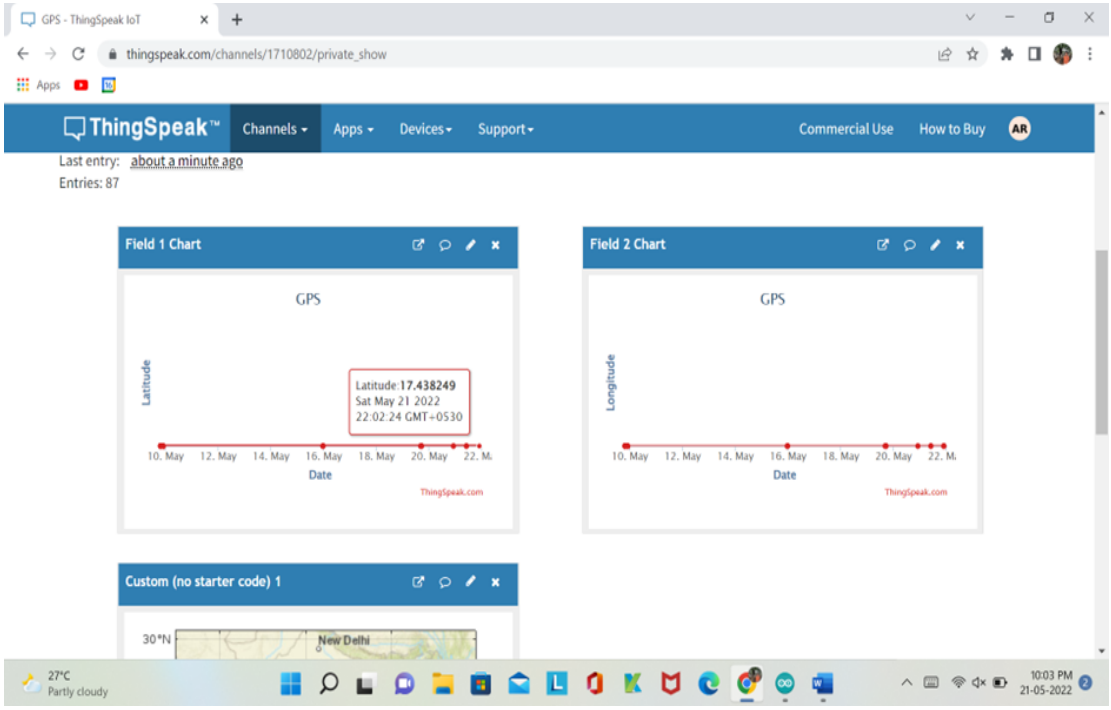


Fig 6.3.1 Location coordinates in graph (Latitude)

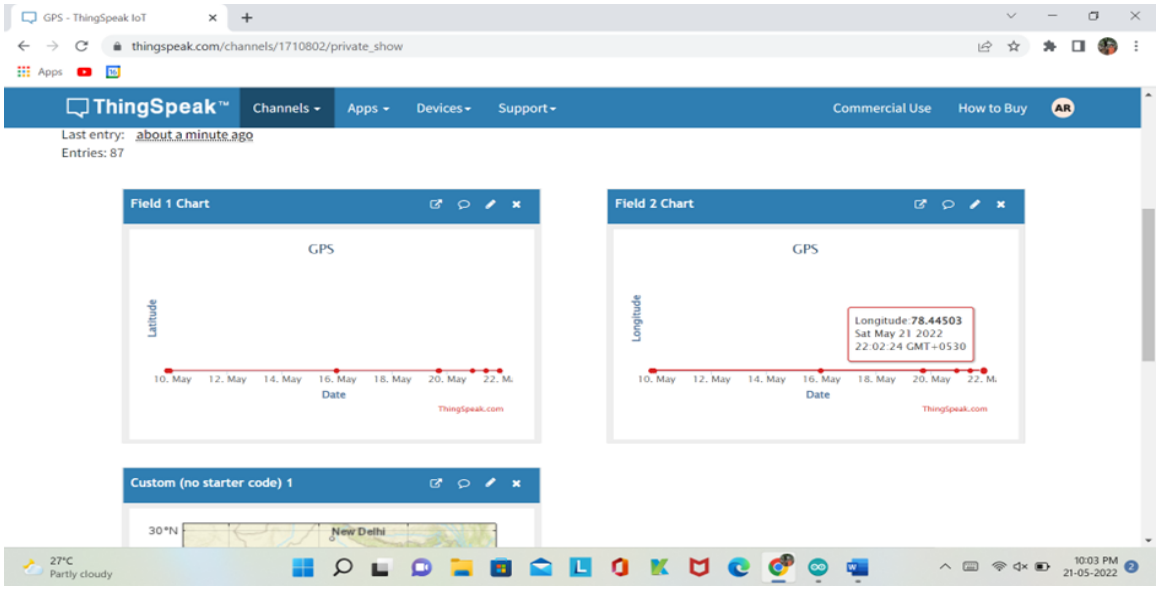


Fig 6.3.2 Location coordinates in graph (Longitude)

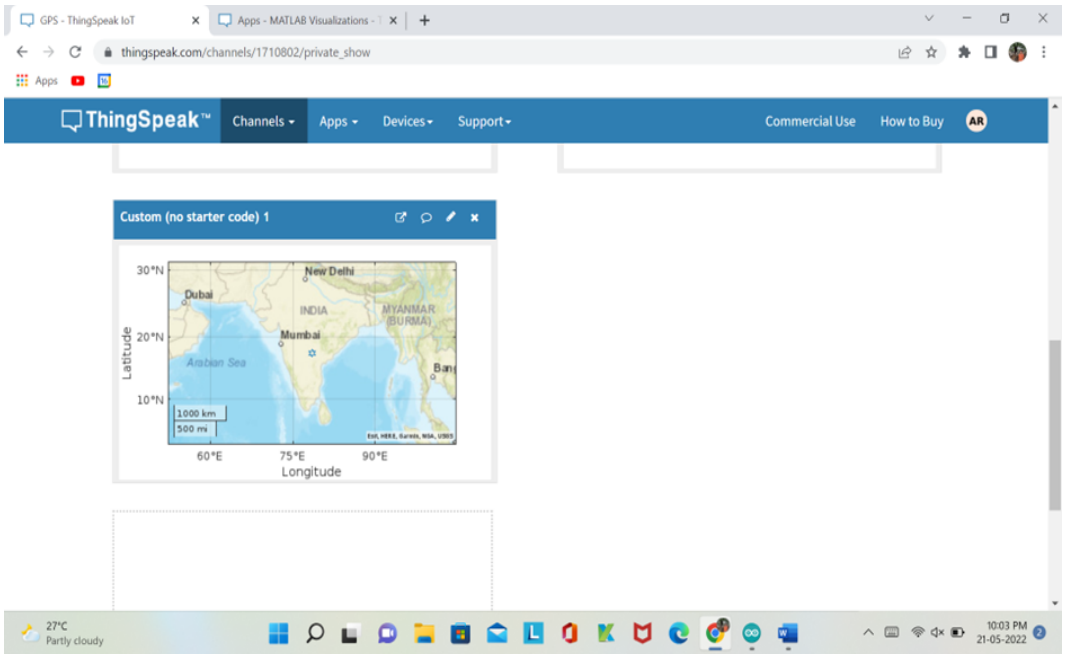


Fig 6.3.3 Map visualization in ThingSpeak

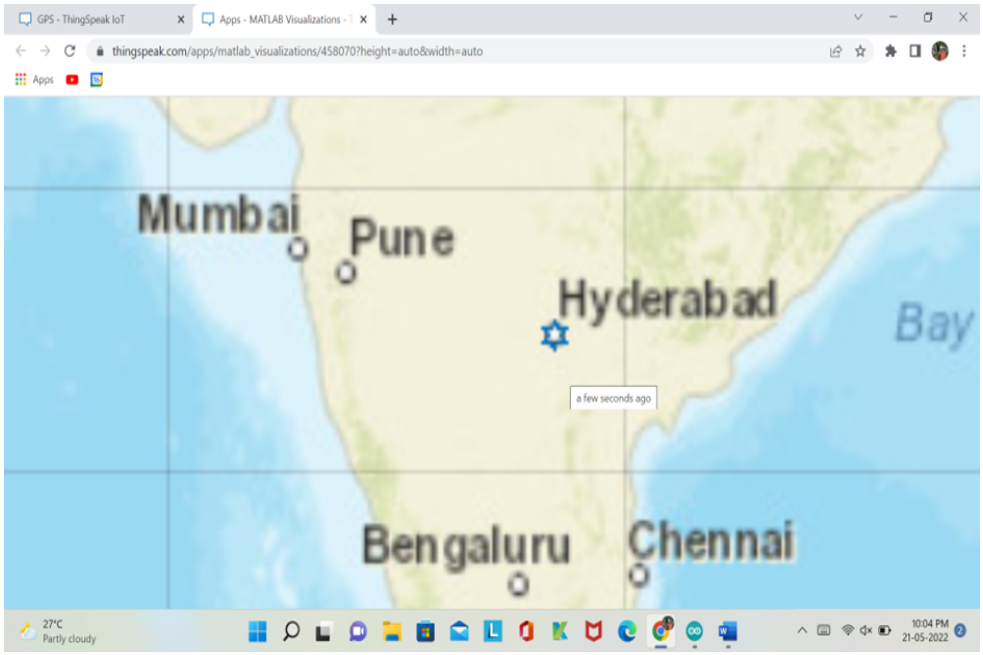


Fig 6.3.4 Map visualization in ThingSpeak in web

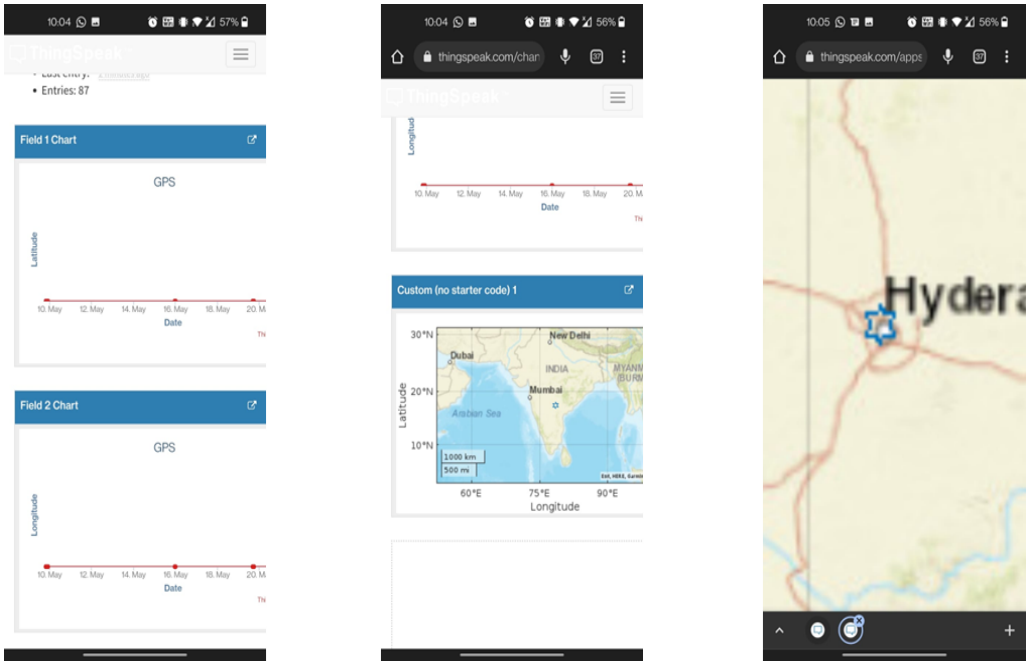


Fig 6.3.5 ThingSpeak channel viewed in mobile graphical coordinates and map of tracking

CHAPTER 7

CONCLUSION AND FUTURE SCOPE

7.1 CONCLUSION

The main objective of our project is securing an automobile.The aim is to offer the security of vehicles. Relying on protection structures and security is not avoidable in day to day lives. The proposed project affords protection and detects robbery accurately at low rates. This project primarily aims at the prevention of vehicle robbery using GSM and GPS tracking.The location of the vehicle will be visualized on Thingspeak. The system especially pursuits to offer a low-value robbery detection setup and additionally pursuits to guard automobiles from robbery.

7.2 FUTURE SCOPE

To improve the scope of this project , involvement of additional features like adding biometric authorisation, image capturing inside the vehicle,etc can be carried out. These features may require storage of huge data. With the ongoing technological modernisation, these requirements can be met. Vehicle theft is an open problem but with advancement in the solutions, a decline in the thefts can be expected in the near future.

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