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A

MAJOR PROJECT REPORT ON

"VEHICLE THEFT ALERT AND ENGINE-LOCK SYSTEM"

Project Supervisor

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SUBMITTED TO:

Department of Electronics and Computer Engineering

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September, 2019

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A PROJECT WAS SUBMITTED TO THE DEPARTMENT OF ELECTRONICS AND COMPUTER ENGINEERING IN PARTIAL FULFILLMENT OF THE REQUIREMENT FOR THE BACHELOR’S DEGREE IN ELECTRONICS AND COMMUNICATION ENGINEERING

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PASHCHIMANCHAL CAMPUS

DEPARTMENT OF ELECTRONICS AND COMPUTER ENGINEERING

CERTIFICATION

The undersigned certify that they have read and recommended to the Institute of Engineering for acceptance, a project report entitled "**VEHICLE THEFT ALERT AND ENGINE-LOCK SYSTEM**" submitted by **Abhayaraj Puri, Amrit Kumar Jha, Gopal Karn** and **Subash Pahari** in partial fulfillment for the degree of Bachelor of Engineering in Electronics and Communication Engineering.

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ABSTRACT

Insecurity is one of the major challenges that the entire world is facing now, each country having their peculiar security issues. The crime rate in every part of the society these days has become a threatening issue and mostly stolen vehicles are now used for committing criminal activities. This project deals with the design & development of a theft control system for a vehicle. Traditionally or to the recent past, the idea of vehicle tracking and ignition locking system in traffic system was not used. So, it results in the theft of vehicles due to lack of implementation of security system in automobiles. In order to address the security problem, we have purposed a system to track the vehicle and lock the engine using GPS and GSM system.

These systems report the location of vehicle on demand. The ignition locking system provides the facility to send SMS to the GSM, so that microcontroller issues the control signals to stop the engine motor which is facilitated by closing the fuel pipe through solenoid valve. Authorized person need to send the password to controller to restart the vehicle and open. This is more secured, reliable and low cost technology. In this project we have attempted to add the technological features to either commercial or personal automobiles where they have the risk of theft of their vehicles. So this project integrates GSM/GPRS, GPS and Database along with web technologies like webpage, android application, Google map etc.at the end of the implementation to meet the criteria we have proposed the project for.

Key Words: GSM, GPRS, Database, GPS, Google Map

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LIST OF ABBREVIATIONS

GND	Ground
GNSS	Global Navigation Satellite System
GPIO	General Purpose Input-Output
GPRS	General Packet Radio System
GPS	Global Positioning System
GSM	Global System for Mobile Communication
HTML	Hypertext Markup Language
HTTP	Hypertext Transfer Protocol
ISP	Internet Service Provider
PHP	Hypertext Pre-Processor
LCD	Liquid Crystal Display
PIR	Passive Infrared
SMS	Short Messaging Service
DBMS	Database Management System
ETU	European Telecommunication Union
IDE	Integrated Development Environment
USB	Universal Serial Bus
ROM	Read Only Memory
Tx	Transmission
Rx	Reception
PIC	Peripheral Interface Controller

IOT	Internet of Things
AVR	Automated Voltage Regulator
ICSP	Internet and Computer Service Provider
SIM	**S**ubscriber's Identification Module
MODEM	Modulator and Demodulator
AT	Attenuation
PID	Passive Infrared Detector
IC	Integrated Circuit
PCB	Printed Circuit Board
API	Application Program Interface
MySQL	My Structured Query Language
CMS	Content Management System
ADT	Android Development Tools
RAM	Random Access Memory
JDK	Java Development Kit
GLONASS	Global Navigation Satellite System
RISC	Reduced Instruction Set Computer

CHAPTER 1

INTRODUCTION

1.1 BACKGROUND AND PROJECT OVERVIEW

The history of vehicle tracking dates back to the beginning of GPS technology when the experimental 'Block-I GPS satellite' was launched into space. Manufactured by Rockwell international, this system was a successful test; and by the end of 1985, 10 more Block-I satellites were launched to further validate the concept.

In the early years, the technology was not yet operational, due to an insufficient number of satellites orbiting the earth. On Jan. 17, 1994, after years of gradual growth, the final of the first 24 satellites was launched, and the GPS system was considered fully operational. Today, fleet tracking taps into this same technology.

Vehicle tracking system main aim is to give Security to all vehicles. This is improved security systems for vehicles. The latest like GPS are highly useful now days, this system enables the owner to observe and track his vehicle and find out vehicle movement and its past activities of vehicle.

This new technology, popularly called vehicle Tracking Systems which created many wonders in the security of the vehicle. This hardware- is fitted on to the vehicle in such a manner that it is not visible to anyone who is inside or outside of the vehicle. Thus it is used as a covert unit which continuously or by any interrupt to the system, sends the location data to the monitoring unit.

When the vehicle is stolen, the location data from tracking system can be used to find the location and can be informed to police for further action. Some Vehicle tracking System can even detect unauthorized movements of the vehicle and then alert the owner. This gives an edge over other pieces of technology for the purpose. These systems report the location of vehicle on demand. The ignition locking system provides the facility to send SMS to the GSM, so that the microcontroller issues the control signals to stop the engine motor which is facilitated by closing the fuel pipe through solenoid valve, Authorized person need to send the password to controller to restart the vehicle, and open, This is more secured, reliable and low cost technology. The proposed system is used for positioning,

and navigating the vehicle with an accuracy of 10 m. The Exact location is indicated in the form of latitude and longitude along with the exact Navigated track on Google map. The system tracks the location of particular vehicle and sends to users mobile in form of data and also to microcontroller. The arrived data, in the form of latitude and longitude is used to locate the vehicle on the Google maps and also we can see the output on the LCD.

1.2 OBJECTIVES

Through the implementation and formulation of GPS, GSM/GPRS and various interfacing of motors, valves in our project, we view the accurate and reliable finding of the position of the user as the pre-requisite goal as well as we made the received location from the GPS to the Google map through GSM-GPRS technology.

The objectives are categorized into two sections:

GENERAL OBJECTIVES

i. To find the specific location efficiently
ii. To learn how to use the GSM-GPRS for sending and receiving the message.
iii. To make the efficient use of wireless communication.

SPECIFIC OBJECTIVES

i. To develop vehicular tracking system to monitor and manage a public transportation system.
ii. To navigate and fleet monitoring.
iii. To provide ignition locking system from mobile.
iv. To find the location of theft vehicle.
v. To prevent unauthorized access.

1.3 PROBLEM STATEMENT

Many of the people have their own vehicle and it is nearly impossible to watch over their vehicle all the time for its security .Peoples wants to protect their vehicle from theft and want to know the location of the vehicle. There is also unmanaged public transportation system which does not follow their time schedule for their arrival and departure time .Some of other problem analysis are given below:

PROBLEM ANALYSIS

i. Vehicle theft
ii. No fleet monitoring and Navigation
iii. Lacks Ignition locking system for theft vehicle at remote places.
iv. Unsystematic Transportation management
v. Unmanaged public vehicle arrival time at bus station.

METHODS OF SOLUTION

On viewing above discussed problems we want to contribute a little for the solution for those problems with the use of "Vehicle theft alert and Engine locking system".

i. In these proposed system we are going to use the GPS and GSM device to know the exact location of the vehicle.
ii. In case of vehicle theft, the owner can lock the vehicle by closing the motors (wheels) through motor driver.
iii. The problem, of bus timing and other problem could be solved by schedule monitoring of buses.
iv. Real time information is provided to the user about their automobiles as well as the route and time information for public transport, this could be done by using GPS's in the buses.

CHAPTER 2

LITERATURE REVIEW

In the early days of fleet tracking, in order to properly track a fleet, each vehicle had to be enabled with a costly GPS device. The company was required to pay a typically high monthly fee to use the satellite tracking system. While helpful, these early systems were difficult to implement, costly to use and sometimes inconvenient for diverse and billet management alike: Thus it took several years for the concept to catch on. In the earliest days, only large, wealthy fleets took advantage of the technology.

The modern fleet tracking system provides the necessary data to fleet managers allowing them to run their operations more efficiently. Reports on driver behaviour, vehicle performance and fuel use all make it easier for the fleet manager to cut costs and increase efficiencies. These systems go beyond simple reporting of each vehicle's location, offering fleet managers a wealth of information about their vehicles and their drivers.

The following research has been done already for vehicle tracking and from this idea we came to conclude our project.

2.1 Advanced Vehicle Tracking System on Google Earth

In this paper GPS based vehicle tracking/navigation, system is implemented. This is done by fetching the information of the vehicle like location, distance etc. by using GPS and GSM. The information can be transformed with the following features: The information of the vehicle like location, etc., is obtained after every specified time interval defined by the user. Then this periodic information of location is transmitted to monitoring or tracking server. This transmitted information is displayed on the display unit by using the Google earth to display vehicle location in the electronic Google maps.

2.2 GPS-GSM based Tracking with Google map based monitoring:

This system uses Global Positioning System (GPS) which is used to receive the coordinates of latitude and longitude form the satellite during the critical information. We all know that tracking system is nowadays a very important in modern world. This system can be used in the monitoring of soldiers, also in tracking the theft of the vehicle and in more other

applications. This system uses microcontroller, Global positioning System (GPS) and Global System for Mobile Communication (GSM). This system uses only one GIPS device and GSM enable a two way communication process. GSM modem is provide with a SLM card which uses the same and War communication process as we are using in regular phone.

2.3 Implementation of RISC

As a means of authentication, advanced RISC machine processor along with face recognition system is used. When an attempt is made to steal the vehicle, the owner is notified using MMS with the help of GSM/GPRS. The proposed security system for smart cars used to prevent them from loss or theft using Advanced RISC Machine (ARM) processor. It performs the real time user authentication (driver, who starts the car engine) using face recognition, using the Principle Component Analysis (PCA) algorithm. According to the comparison result (authentic or not), ARM processor triggers certain actions. If the result is not authentic means ARM produces the signal to block the car access (i.e. Produce the interrupt signal to car engine to stop its action) and inform the car owner about the unauthorized access via Multimedia Message Services (MMS) with the help of
GSM/GPRS modem.

2.4 Sensor Network

Hui Song et al. explained Sensor-network-based Vehicle Anti-Theft System (SVATS). In this system, the sensors in the vehicles that are parked within the same parking area first form a sensor network, then monitor and identify possible vehicle thefts by detecting unauthorized vehicle movement. When an unauthorized movement is detected, an alert will be reported to a base station in the parking area, which sends warning messages to the security office. This paper focuses on the technical issues specific to the system such as topology management, theft detection, and intra-vehicle networking. These systems however bear some limitations such as high cost, high false-alarm rate, and easy to be disabled.

Above system only provides the location and distance covered by the system but ignores the vehicle security and accident alert system. Thus we came to conclude add Ignition locking facility

CHAPTER 3

HARDWARE DESCRIPTION

3.1 Arduino Uno:

The Arduino UNO R3 is a microcontroller board based on a removable, dual-inline-package (DIP) ATmega328 AVR microcontroller. It has 20 digital input/output pins (of which 6 can be used as PWM outputs and 6 can be used as analog inputs), a 16 MHz resonator, a USB connection, a power jack, an in-circuit system programming (ICSP) header, and a reset button. Arduino Uno microcontroller can sense the environment by receiving input from a variety of sensors and can affect its surroundings by controlling lights, motors, and other actuators. The microcontroller is programmed using the Arduino programming language (based on Wiring) and the Arduino development environment (based on Processing). It contains everything needed to support the microcontroller; simply connect it to a computer (or appropriate wall power adapter) with a USB cable or power it with AC-to-DC adapter or battery to get started.

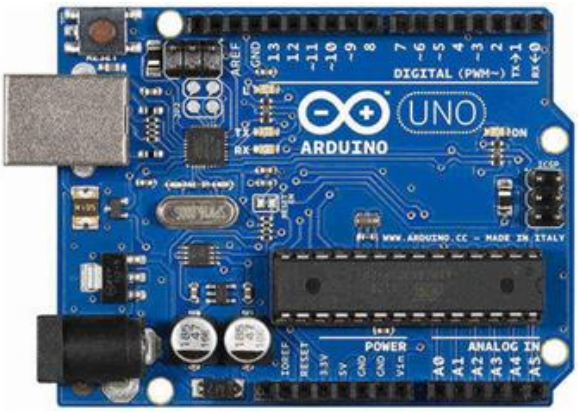


Figure 3.1: Arduino Uno

(Source: [Online]. Available: https://learn.sparkfun.com/tutorials/what-is-an-arduino/all. [Accessed: 21- Jul-2019].)

Features of Arduino Uno:

- The chip on the board plugs straight into your USB port and supports on your computer as a virtual serial port. The benefit of this setup is that serial communication is an extremely easy protocol which is time-tested and USB makes connection with modern computers and makes it comfortable.

- It is an open source design and there is an advantage of being open source is that it has a large community of people using and troubleshooting it. This makes it easy to help in debugging projects.
- It is a 16 MHz clock which is fast enough for most applications and does not speeds up the microcontroller.
- It is very convenient to manage power inside it and it had a feature of built-in voltage regulation. This can also be powered directly off a USB port without any external power. You can connect an external power source of up to 12v and this regulates it to both 5v and 3.3v.
- 13 digital pins and 6 analog pins. This sort of pins allows you to connect hardware to your Arduino Uno board externally. These pins are used as a key for extending the computing capability of the Arduino Uno into the real world. Simply plug your electronic devices and sensors into the sockets that correspond to each of these pins and you are good to go.
- This has an ICSP connector for bypassing the USB port and interfacing the Arduino directly as a serial device. This port is necessary to re-boot load your chip if it corrupts and can no longer used to your computer.
- It has a 32 KB of flash memory for storing code.

3. 2 GSM SIM900A:

GSM is global system for mobile communication and used to send message to pre-programmed number. The modulation technique used is GSM. The protocol used by GSM modem for setup and control is based on the Hayes AT- Command set. AT is the abbreviation of Attenuation.

SIM900A is an ultra-compact and reliable wireless module. The SIM900A is a complete Dual-band GSM/GPRS solution in a SMT module which can be embedded in the customer applications allowing you to benefit from small dimensions and cost-effective solutions. Featuring an industry-standard interface, the SIM900A delivers GSM/GPRS 900/1800MHz performance for voice, SMS, Data, and Fax in a small form factor and with low power consumption.

The purpose of using GSM module is to communicate between vehicle and the owner. The owner will send message from his mobile phone to GSM module which is installed in vehicle .After receiving message from owner number the GSM module reply back to his

owner sending latitude and longitude of the vehicle. Using latitude and longitude the owner can detect the exact location of his vehicle. GSM works on frequencies 850MHz ,900 MHz,1800MHz and 1900MHz.The baud rate can be configured from 9600-11200 through AT command .

Figure 3.2: GSM SIM900A Chip

(Source:[Online].Available:https://www.open-electronics.org/gsm-remote-control-part-4-sim900/.[Accessed: 18- Sep- 2019].)

Figure 3.3: SIM900A Module

(Source:[Online]. Available: https://www.elementzonline.com/sim900a-gsm-modem-module-v1-2-with-sma-antenna-rs232-ttl-output--228. [Accessed: 18- Sep- 2019].)

3.3 GPS Neo-6m:

The System (GPS Global Positioning) is a space age navigational system that can pinpoint your position anywhere on the globe, usually within a few yards or meters. GPS uses a constellation of 24 satellites in precise orbits approximately 12,000 miles above the earth. GPS uses satellite ranging to triangulate your position from minimum 3 different satellites, GPS can calculate a latitude and longitude and track movement. With four or more satellites in view, the receiver can determine the user's latitude, longitude and altitude. A GPS tracking system uses the Global Navigation Satellite System (GNSS) network. This network incorporates a range of satellites that use microwave signals that are transmitted to GPS devices to give information on location, vehicle speed, time and direction. So, a GPS tracking system can potentially give both real-time and historic navigation data on any kind of journey. GPS provides special satellite signals, which are processed by a receiver. These GPS receivers not only track the exact location but can also compute velocity and time. The positions can even be computed in three-dimensional views with the help of four GPS satellite signals. The Space Segment of the Global Positioning System consists of 27 Earth-orbiting GPS satellites. There are 24 operational and 3 extra (in case one fails) satellites that move round the Earth each 12 hours and send radio signals from space that are received by the GPS receiver. The control of the Positioning System consists of different tracking stations that are located across the globe.

Unlike other GPS modules, Neo-6m can do up to 5 location updates a second with 2.5m Horizontal position accuracy. One of the best features the chip provides is Power Save Mode (PSM). It allows a reduction in system power consumption by selectively switching parts of the receiver ON and OFF. This dramatically reduces power consumption of the module to just **11mA.**

The function of GPS module in this vehicle tracking system is to find out the current location of vehicle. The GPS calculate the location of vehicle using satellite communication and then sends it to Arduino board. The GPS module calculate location of vehicle when the GSM module request for the location of the vehicle. The GPS requires 3.5-5V of power supply for operation and 9600 baud rate. The power can be supplied to the GPS from 5v pin of Arduino.

Figure 3.4: GPS Neo-6m module

(Source: [Online]. Available: https://www.indiamart.com/proddetail/neo-6m-gps-module-19819679162.html. [Accessed: 22- Jul- 2019].)

3.4 16*2 LCD:

An LCD is an electronic display module which uses liquid crystal to produce a visible image. The 16×2 LCD display is a very basic module commonly used in DIYs and circuits. The 16×2 translates of a display 16 characters per line in 2 such lines. In this LCD each character is displayed in a 5×7 pixel matrix. LCDs are used in a wide range of applications including computer monitor, televisions, Instrument panels, aircraft cockpit displays etc. They are common in consumer devices such as DVD players, gaming devices, clocks, watches, calculators, and telephones, and have replaced CRT displays in most applications. The LCD screen is more energy efficient and can disposed of more safely than a CRT. Its low electrical power consumption enables it to be used in battery-powered electronic equipment.

Generating custom characters on LCD is not very hard. It requires the knowledge about custom generated random access memory (CG-RAM) of LCD and the LCD chip controller.

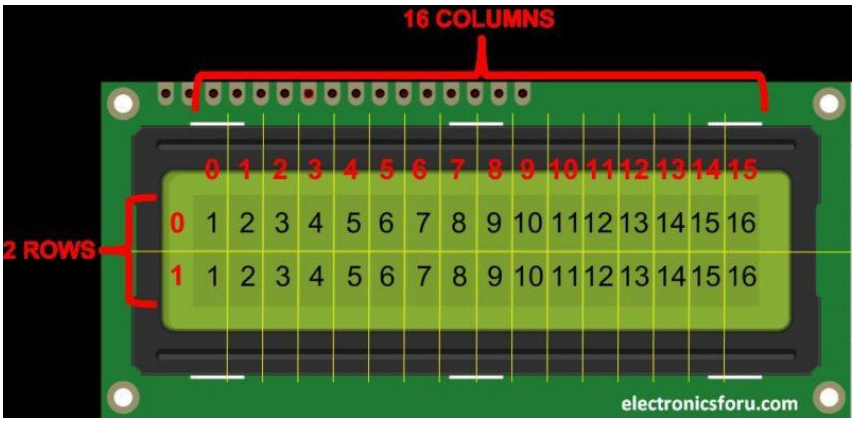


Figure 3.5: 16*2 LCD Display

(Source:[Online]. Available: https://electronicsforu.com/resources/learn-electronics/16x2-lcd-pinout-diagram. [Accessed: 22- Jul- 2019].)

Most LCDs contain Hitachi HD4478 controller. CG-RAM is the main component in making custom characters. It stores the custom characters once declared in the code. CG-RAM size is 64 byte providing the option of creating eight characters at a time. Each character is eight byte in size. CG-RAM address starts from 0x40 (Hexadecimal) or 64 in decimal. We can generate custom characters at these addresses. Once we generate our characters at these addresses, now we can print them on the LCD at any time by just sending simple commands to the LCD.

3.5 PIR Sensor:

PIR sensors allow you to sense motion, almost always used to detect whether a human has moved in or out of the sensors range. They are small, inexpensive, low-power, easy to use and don't wear out. For that reason they are commonly found in appliances and gadgets used in homes or businesses. They are often referred to as PIR, "Passive Infrared", "Pyro electric", or "IR motion" sensors. The term “passive” indicates that the sensor does not actively take part in the process, which means, it does not emit the referred IR signals itself, rather passively detects the infrared radiations coming from the human body in the surrounding area. The detected radiations are converted into an electrical charge, which is proportional to the detected level of the radiation. Then this charge is further improved by a built in FET and fed to the output pin of the device which becomes applicable to an external circuit for further triggering and amplification of the alarm stages.

Figure 3.6: PIR Sensor

(Source: [Online]. Available: https://learn.adafruit.com/pir-passive-infrared-proximity-motion-sensor/overview. [Accessed: 21- Jul- 2019].)

3.6 Motor Driver (L298N):

The L298N is a dual H-Bridge motor driver which allows speed and direction control of two DC motors at the same time. The module can drive DC motors that have voltages between 5 and 35V, with a peak current up to 2A. Two enable inputs are provided to enable or disable the device independently of the in-put signals .The emitters of the lower transistors of each bridge are connected together rand the corresponding external terminal can be used for the connection of an external sensing resistor.

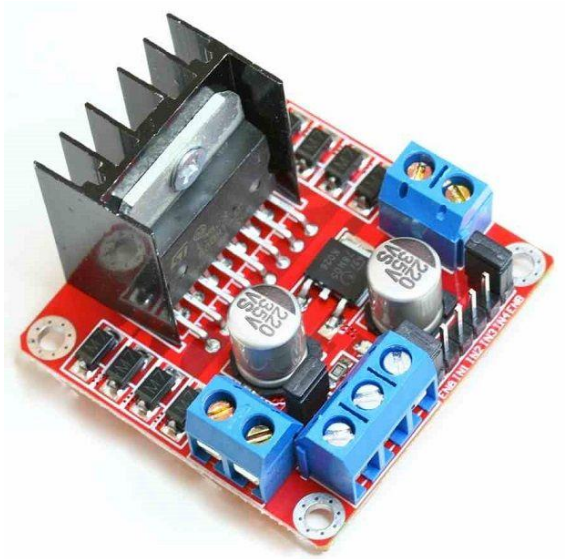


Figure 3.7: L298N Motor driver

(Source: [Online]. Available: https://tronixlabs.com.au/news/tutorial-l298n-dual-motor-controller-module-2a-and-arduino/. [Accessed: 20- Jul- 2019].)

3.7 Power Supply:

The Arduino is supplied by 5V power through Laptop in this project using COM3 for communication with Arduino IDE. GSM is supplied by 12V power supply through 12V-1A power adapter which also can be used to supply the motor driver. All other components are supplied directly through Arduino using 5V and 3.3V pin out.

In actual implementation of the system, it will draw the required power from the vehicle's battery. When the system is inactive, it draws a minimal power to keep the system turned on which prevent from rapid decay of the vehicle's battery.

CHAPTER 4

SOFTWARE REQUIREMENTS DESCRIPTION

4.1 Arduino IDE:

The Arduino integrated development environment (IDE) is a cross-platform application (for Windows, mac OS, Linux) that is written in the programming language Java. It is used to write and upload programs to Arduino compatible boards, but also, with the help of 3rd party cores, other vendor development boards. The main code, also known as a sketch, created on the IDE platform will ultimately generate a Hex File which is then transferred and uploaded in the controller on the board. The IDE environment mainly contains two basic parts: Editor and Compiler where former is used for writing the required code and later is used for compiling and uploading the code into the given Arduino Module. This environment supports both C and C++ languages.

Figure 4.1: Arduino IDE View

4.2 Android Studio:

Android Studio is the official IDE for Google's Android operating system, built on JetBrain's IntelliJ IDEA software and designed specifically for Android development. It is a replacement for the Eclipse ADTs as the primary IDE for native android application development. The features of Android Studio that makes it suitable for android app development are:

- Code and iterate faster than ever: Based on Intellij IDEA, Android Studio provides the fastest possible turnaround on your coding and running workflow.
- Code with confidence: At every step, Android Studio helps ensure that you're creating best code possible.
- Configure builds without limits: Android Studio's project structure and Gradle-based builds provide the flexibility you need to generate APKs for all device types.
- Create rich and connected apps: Android Studio knows not all code is written in Java and not all code runs on the user's device.
- Eliminate tiresome tasks: Android Studio provides GUI tools that simplify the less interesting parts of app development.

We created an app named "Tracker" using android studio which can get the location and lock engine of vehicle by clicking a simple button. The app is also used to broadcast the message of theft along with the real time location of the vehicle to the owner's number.

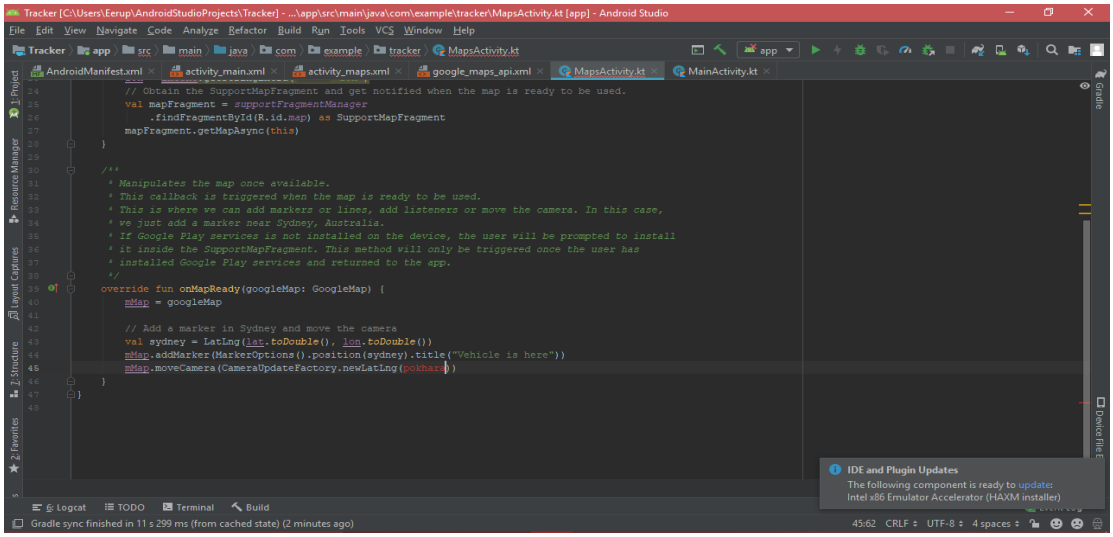


Figure 4.2: Screenshot of Android Application Development

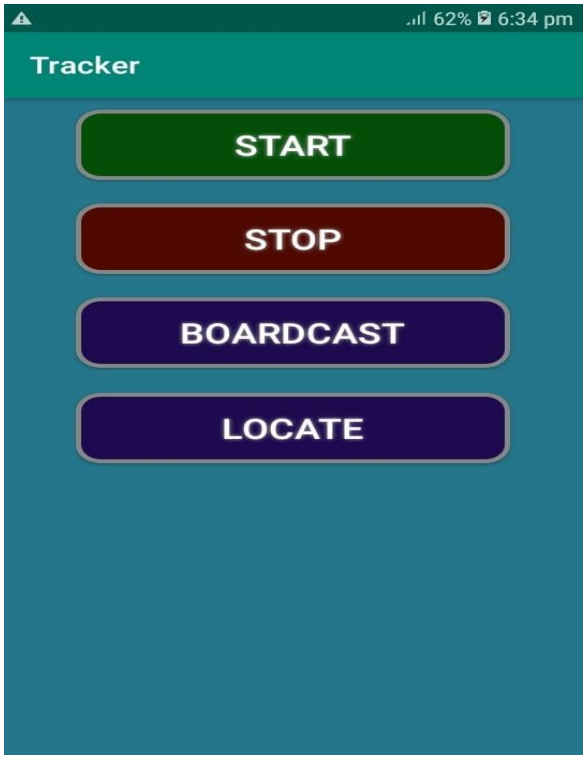


Figure 4.3: Mobile View of Android Application for Project

4.3 Sublime Text 3:

Sublime Text is a proprietary cross-platform source code editor which is used in this project to develop the website.

Some stand out features of sublime text is:

- Use Go to anything to open files with only a few keystrokes, and instantly jump to symbols, lines or words.
- Using information from syntax definitions, Sublime Text automatically generates a project-wide index of every class, method and function. This index powers Go to Definition.
- Multiple selections allow you to interactively change many lines at once, rename variables with ease, and manipulate files faster than ever.
- Get the most out of your wide screen monitor with split editing support. Edit files side by side, or edit two locations in one file.

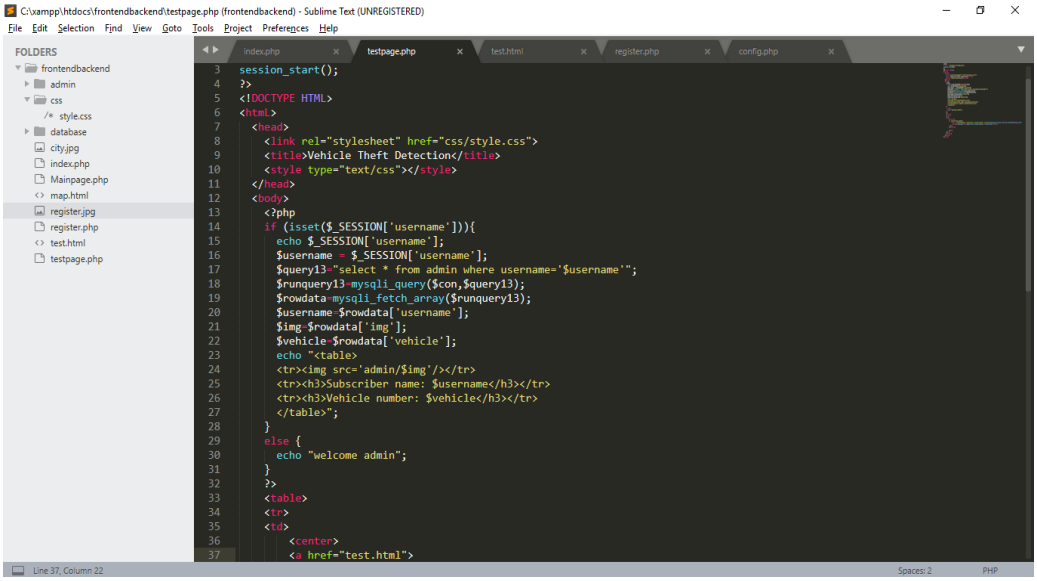


Figure 4.4: Website development using Sublime Text 3

4.4 XAMPP:

XAMPP stands for Cross-Platform (X), Apache (A), Maria DB (M), PHP (P) and Perl (P). It is a simple, lightweight Apache distribution that makes it extremely easy for developers to create a local web server for testing and deployment purposes. Everything needed to set up a web server –server application (Apache), database (Maria DB), and scripting language (PHP) – is included in an extractable file. Since most actual web server deployments use the same components as XAMPP, it makes transitioning from a local test server to a live server extremely easy as well. In this project, XAMPP was used to create a local server to test the website's frontend and backend as well as create an online database using SQL.

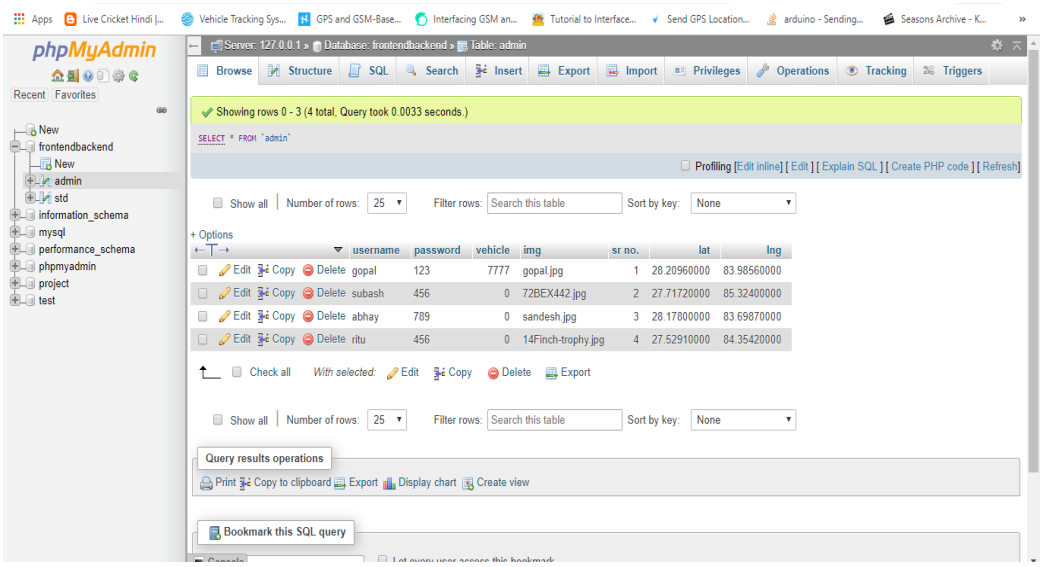


Figure 4.5: XAMPP Control Panel

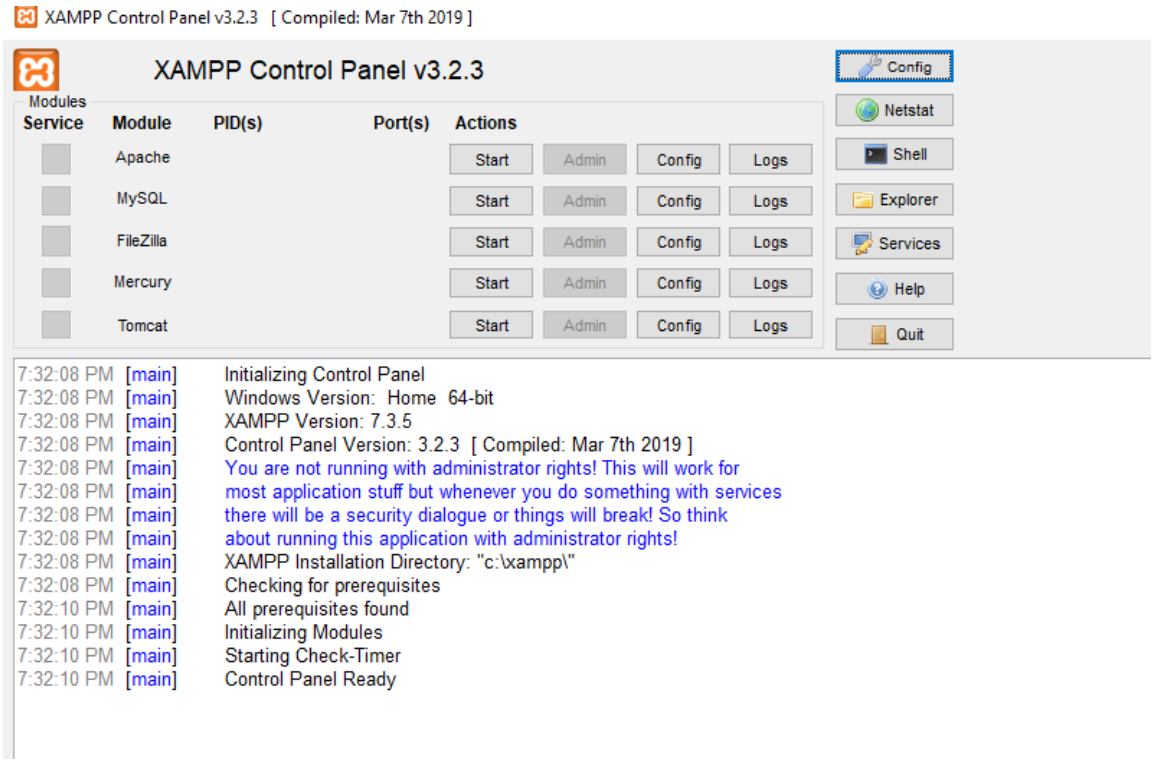


Figure 4.6: MySQL Database

CHAPTER 5

METHODOLOGY

5.1 Working

This project consists of GPS receiver, GSM module, PIR sensor with an Arduino. The whole system is embedded within the vehicle. In other words, a SIM in the GSM module of the embedded system and the other one is the SIM available on the hand held device of the owner. Whenever PIR sensor senses a human inside of the vehicle the present latitude and longitude are sent to the owners SIM from the GSM module within system.

Imagine a vehicle was parked in the parking area in basement or any other parking area. The owner starts the system as s/he leaves the vehicle. Provided that any intruder attempts on the vehicle; as soon as the PIR senses the heat signature. Thus making it a possibility of vehicle theft; the current location of GPS is sent to the owner's hand held device. This is done by Arduino as it collects vehicle's location (latitude and longitude) information from the GPS and then provides the GSM with these co-ordinates. This in turn sends the location to the owner's device.

Well known of the fact that each place is assigned a latitude and longitude. These data sent over to the owner's device (receiver) is the latitude and longitude and is sent via a SMS service.

The developed Android app provides us with four functionalities namely; START, STOP, LOCATE and BROADCAST.

i. START-mode: Whenever the owner presses the START button; a SMS with 'start' as body of the message is sent over the owner's device. The engine of the system is free to run with no any GPS tracking or motor speed hurdles. In simple words, system goes to sleep and stops any functionality thereafter.

ii. STOP-mode: Whenever the owner presses the START button; a SMS with 'stop' as body of the message is sent over the owner's device. The engine of the system gets locked i.e. the motor is jammed so that it can't rotate anymore. Then, the motor can only be accessible after a 'start' SMS is sent to the GSM on the system. In simple words, system is operating; keeping track of vehicle's location and electronically switching off the motor.

iii. BROADCAST: Whenever the owner uses the BROADCAST button; a message from owner's device stating the theft of the vehicle is sent over to the local authorities (police) and can also be broadcasted on social sites for efficient tracking and retrieval of vehicle. This data is also sent over the database and added on the list. Crystal clear; this function only on STOP mode.

iv. LOCATE: Upon pressing this button; user sends a SMS stating 'Track' to the GSM on the system. Upon retrieval of track message; Arduino accesses the GPS location of the vehicle; decodes the latitude and longitude value and sends it to owner's device via same GSM. Android app upon the retrieval of these co-ordinates; displays a google street view (map) of the vehicle's current location.

On the other side, the developed webpage has two sections. The first is the database. The whole database accessible to only authorized users. It consists of following vehicle info: Owner's name, pass-code, Image of the owner, vehicle number and voguish accessed location of the vehicle. Using the login page, users can login into their database and locate the voguish location via a track button available at the bottom left.

In this way, the security of the system starts from a sensing as soon as an intruder enters the system. The user can then locate the vehicle and/or lock the engine of the vehicle upon the user's desire. This makes the system more reliable and user friendly.

5.2 Block Diagram and Block Diagram Description

Block diagram of Vehicle theft alert and engine lock system is shown below. The block diagram shows the overall view of the system in terms of interfacing. The connections of these elements: Arduino, GPS, GSM, PIR, Motor Driver, Motor, Power Supply, etc. as a block element is shown.

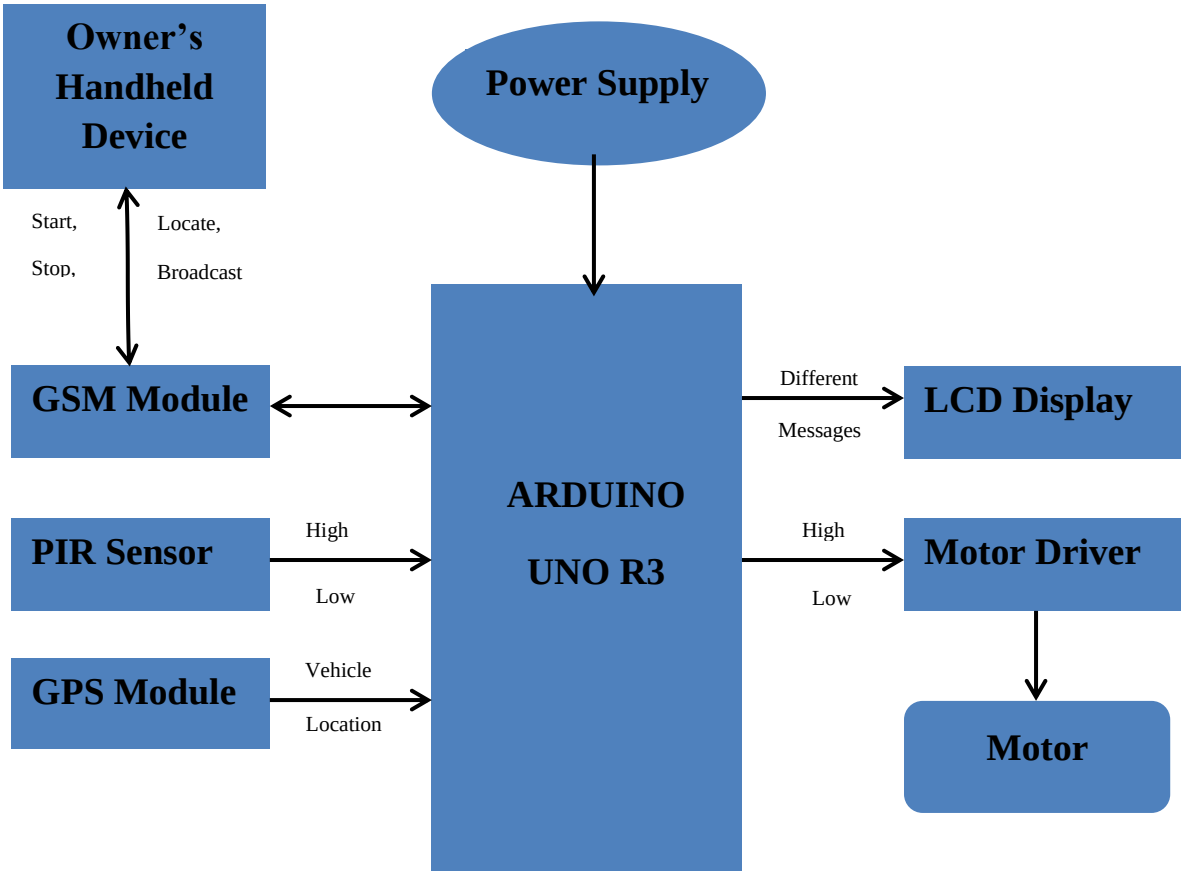


Figure 5.1: Block Diagram of developed system

In this project, it is proposed to design an embedded system which is used for tracking and/or positioning the vehicle by using GPS and GSM.

The user can make use of different options or buttons available in the android app for different functionalities. Upon receiving an alert message, after the sensing of PIR; the user can access the location of the vehicle sending a track message from the user's device to the GSM module in the system. This in turn requests the GPS for current co-ordinates of the vehicle. In addition, the user can also send a stop message to the embedded system in the vehicle. As soon as GSM receives the message it cuts off any supply to the engine or motor thus making the vehicle stationary in the last recorded location. An extra functionality of broadcast; spreads the theft alert over the local authorities and can be broadcasted over social networking site if required. This increases the chances of retrieval of stolen vehicle. After pressing broadcast, the user can use their respective username and pass-code to login in webpage containing the database and view the last voguish location of the vehicle.

Figure 5.2: Physical Architecture of developed system

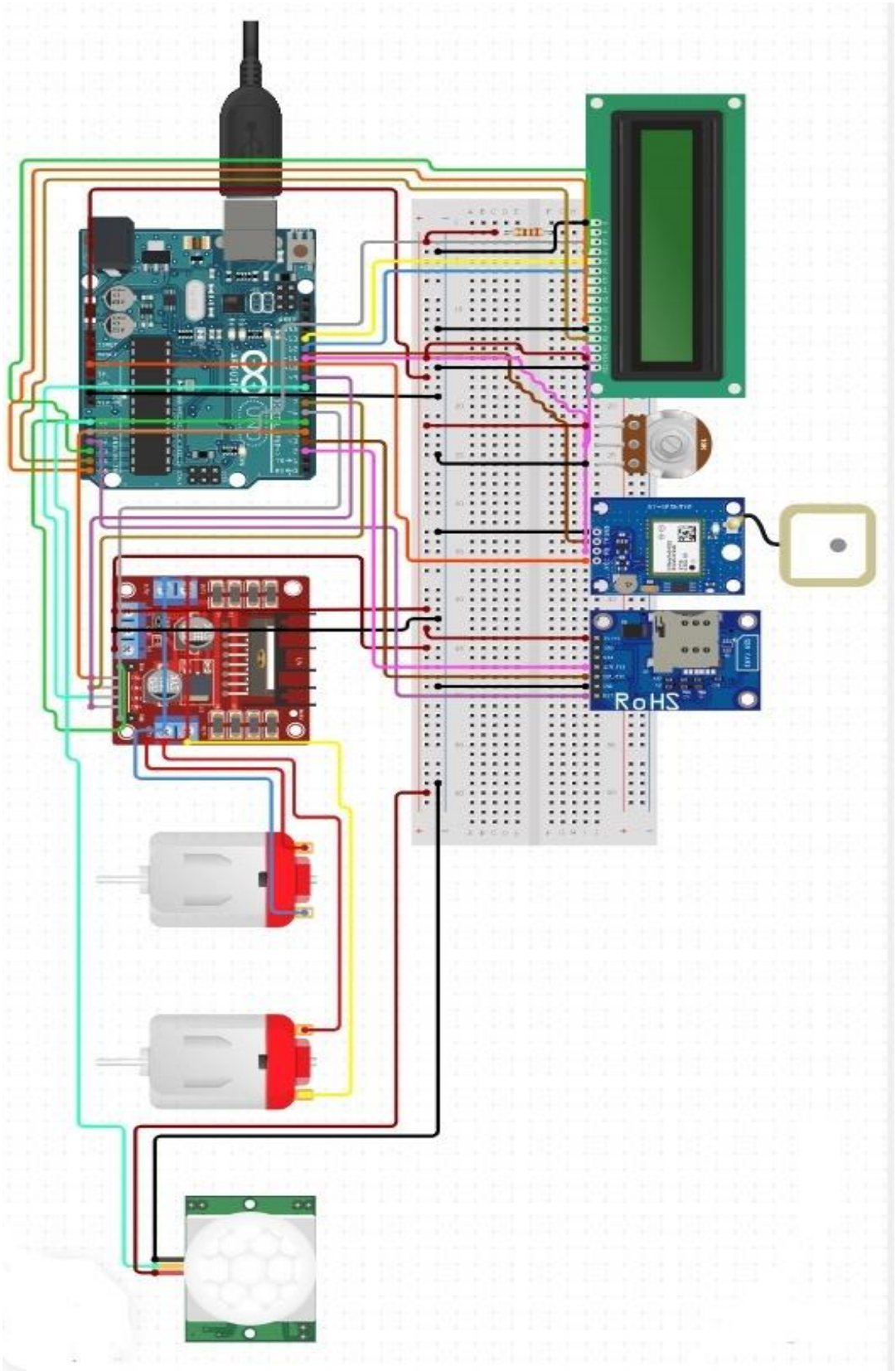
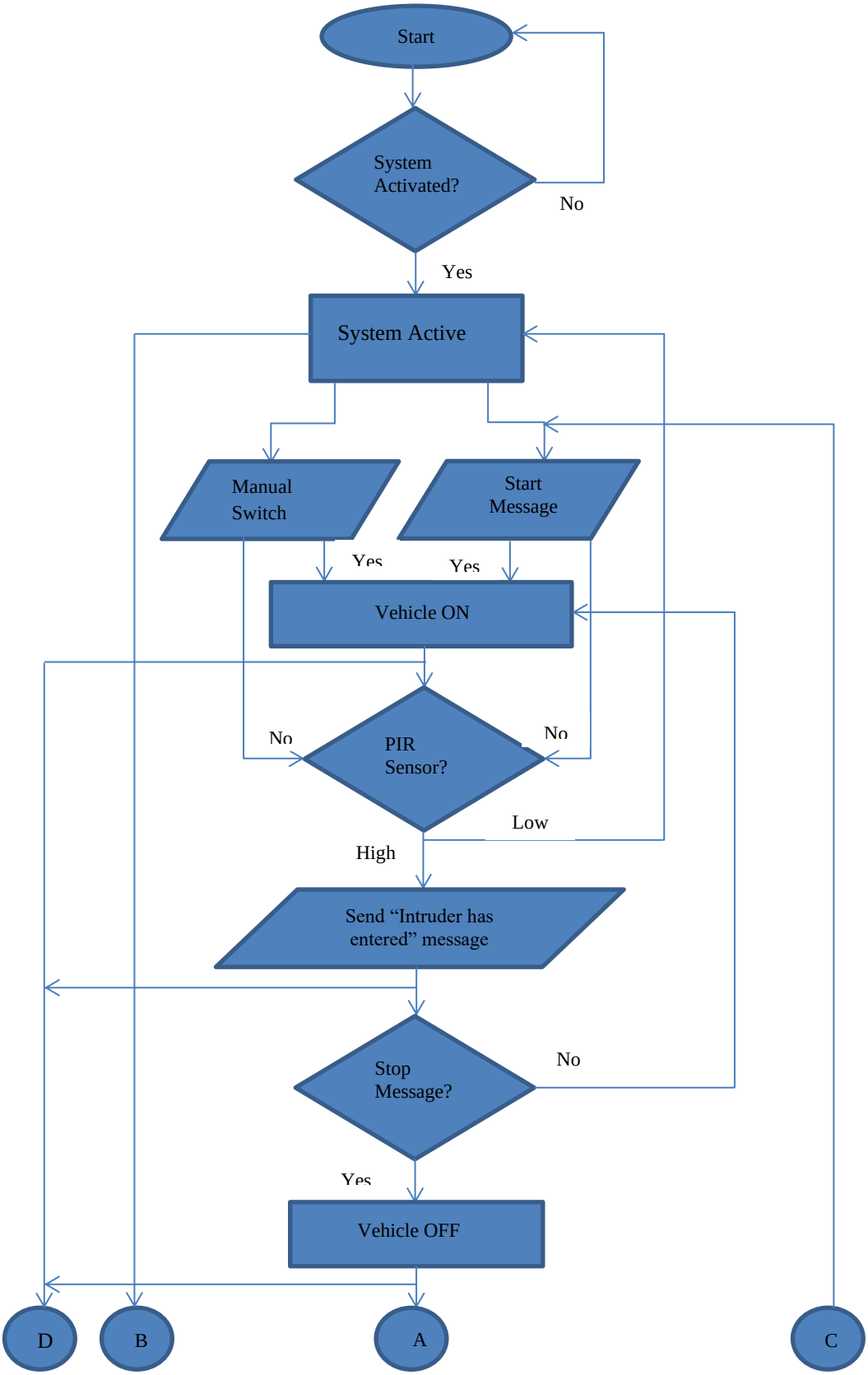


Figure 5.3: Schematic capture of proposed system

5.3 Flowchart



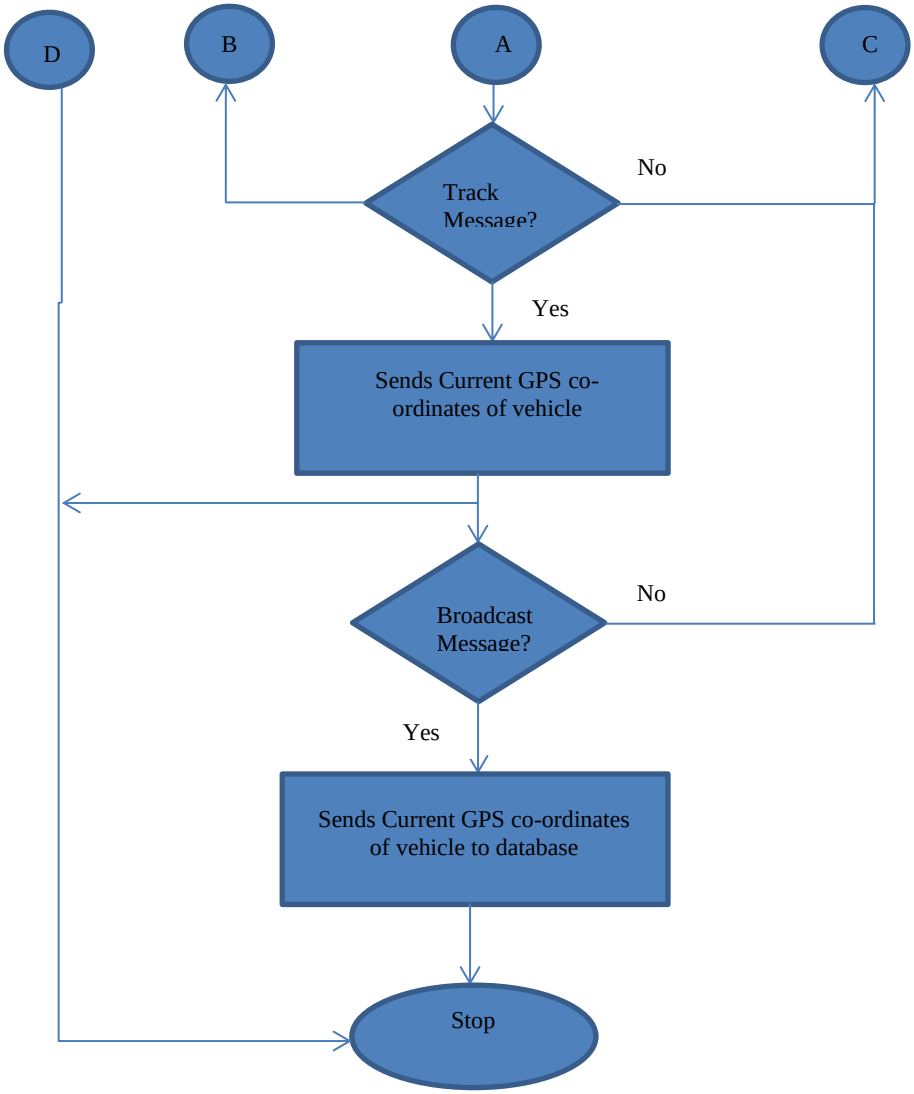


Figure 5.4: Flowchart of proposed system

CHAPTER 6

APPLICATION, SCOPE and RESULT

6.1 Scope and Applications

Commercial fleet operators are by far the largest users of vehicle tracking systems. However, its feasible cost makes it generalizable to the public i.e. private owners can also attain the system and improve their security standard. The developed system provides a variety of applications like: positioning, routing, security, dispatch and collecting on board information.

The use of remote control and monitoring along with real time data (location and theft identification) retrieval from the embedded system makes its application area wide spread in the present day context. From nation-level usage of military and dispatch to person-level usage of tracking the person's lost and/or theft vehicle. Some of the application areas of the project are stated below:

Military: The application can be used in military operations to keep track of the military vehicle in the arena making it cosier for the personnel to locate the vehicle in the field. Likewise, the engine can be locked thus protecting vehicle and national security archive. It can also be used to dispatch military personnel to the location of disaster or accidents.

Organization: This application is feasible for both private organizations and public organizations, to keep track of their automobiles and remotely monitor the vehicle's operations. These organizations can use the system to monitor a specific vehicle or the available vehicles as a fleet; thus protecting the assets and decreasing risk of loss of intellectual property and confidential documents.

Private Owner: Any person can get their hands in this system as seen from the probative provided by the feasibility study. They can track, control and monitor their own vehicle as required.

Public Transportation: As seen on the present day, the count of public transports have been increasing dramatically. The developed system can be used in these transports to monitor the route and time interval between any route and any two destinations i.e.

monitoring the route, scheduling the route and take necessary actions via continuous monitoring.

Geo-fencing: Well known of the fact that the system provides real time location and remote monitoring, any user can use the system for geo-fencing. Since GPS continuously provides the latitude and longitude; in case the system leaves the coded boundary, an alert message is sent and can be remotely stopped if required.

Navigation: Navigation is the act of following a predefined local route between the start and the destination. Our current position being the start and any device upon which the system is embedded becomes our destination thus specifying a predefined route between the locations.

Similarly the scopes of the developed system are stated below:

i. Fleet monitoring
ii. Vehicle scheduling
iii. Route and Vehicle monitoring
iv. Driver monitoring
v. Geo-fencing geo-coding

6.2 Result

We successfully interfaced the PIR sensor to the ATMEGA 16 microcontroller of the ARDUINO UNO and hence transmit the theft intruder detection message to the cell phone of authorized person. After the retrieval of intruder detection the user can use any of the provided buttons in android app for monitoring the vehicle. Whenever the user presses either of start or stop then a message is sent from the owner's device to the GSM with their pre-defined respective messages to keeping the system running or locks the engine respectively. As for locate; GPS tracks the current location of the device upon retrieval of track message. It then sends the co-ordinates to the GSM module which in turn sends the latitude and longitude to the owner's hand held device. The developed android app accesses the SMS with the current location and displays a google map view of the co-ordinates received. Another button titled broadcast: sends the voguish co-ordinates to the database on the webpage which can be used to view the last seen location of the vehicle. The last seen location can be accessed in website from the maintained database and the

view appears as google maps street view. In addition, user can use the locate button as many times as required if the voguish location doesn’t hold true anymore.

On the other section, we first manually start the system to turn on the motor i.e. user initially can access the vehicle without any hindrances. We have installed a motor supplied via a motor driver. The Arduino lowers the supply to the motor driver and finally stops the supply to the motor driver when a stop message is sent. After the engine gets locked via a stop message the engine can no longer be accessed via the manual button. So a start message is obligatory after sending a stop message for the engine to revive. In case somebody tries to drive the vehicle in stop mode the engine won’t start thus improving security standard.

CHAPTER 7

LIMITATIONS and FURTHER MODIFICATIONS

7.1 Limitations

i. Since tracking systems have a sim card inside them, they may be unreachable or may cause delay in communication in areas with poor connectivity like hilly or mountain areas.
ii. PIR sensor doesn't operate above temperature of 35^0C so use of the device under extreme temperature conditions can be tricky.
iii. Sometimes the GPS signals are not accurate due to some obstacles to signal such as buildings, trees and sometimes by extreme atmospheric conditions such as geomagnetic storms.
iv. Dismantling of the system from the vehicle becomes easier provided that the system was not in-built during the manufacture of the vehicle and the burglar is well-known of the theft alert system embedded within the vehicle.
v. Android application need to be refreshed every time the system receives co-ordinates.

7.2 Further Modifications

i. The automobiles airbag system can also be wired to the system to report severe accidents to immediately alert the police and ambulance service with location of the accident which can be aided by accelerometer.
ii. Mounting of CO_2 sensor inside the exhaust pipe can be used to detect the CO_2 concentration thus providing reference to the start of engine.
iii. This sensing system can be further extended using a camera module along with PIR for intruder face detection and forwarding of message via MMS service.
iv. An additional setting could be implemented to interface the system to the car's alarm to alert the owner on his cell phone if the alarm is set off.

CHAPTER 8

CONCLUSION

With the main purpose of controlling the theft of our vehicles we have proper way for efficiently tracking and locking system based on the GPS and GSM technology. This system is very suitable for the present time as every individual is seeking the way towards their vehicle security. The owner of the vehicle can find the exact location of theft vehicle and can stop the vehicle at that location by just sending a SMS from their cell phone. The project is very feasible from all the perspectives and can be a very useful system in future.

The system integration testing was carried out on implemented system in order to ascertain the workability and functionality of each component that makes up the system. System acceptance evaluation was also carried out to ascertain acceptability and effectiveness of the developed system. Result analysed from both the system integration testing and acceptance evaluation shows the implemented system can be deployed and used as a cheaper means of preventing vehicle theft and as a recovery tool for missing or stolen vehicles.

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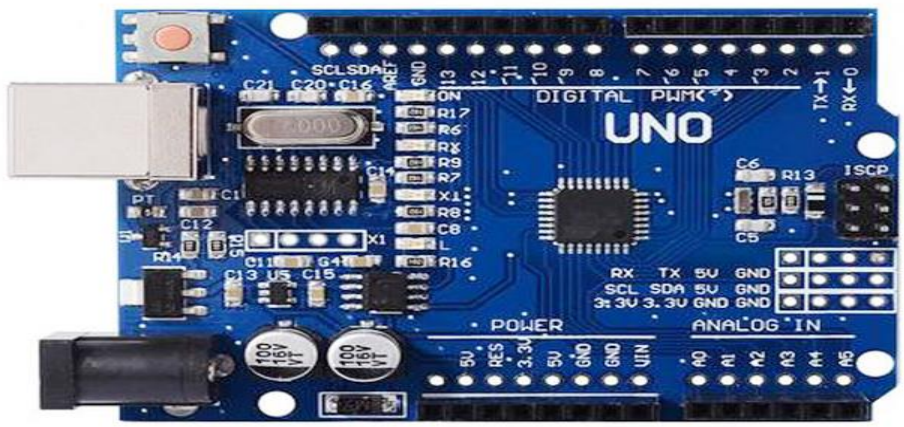
APPENDIX 1: DATASHEET

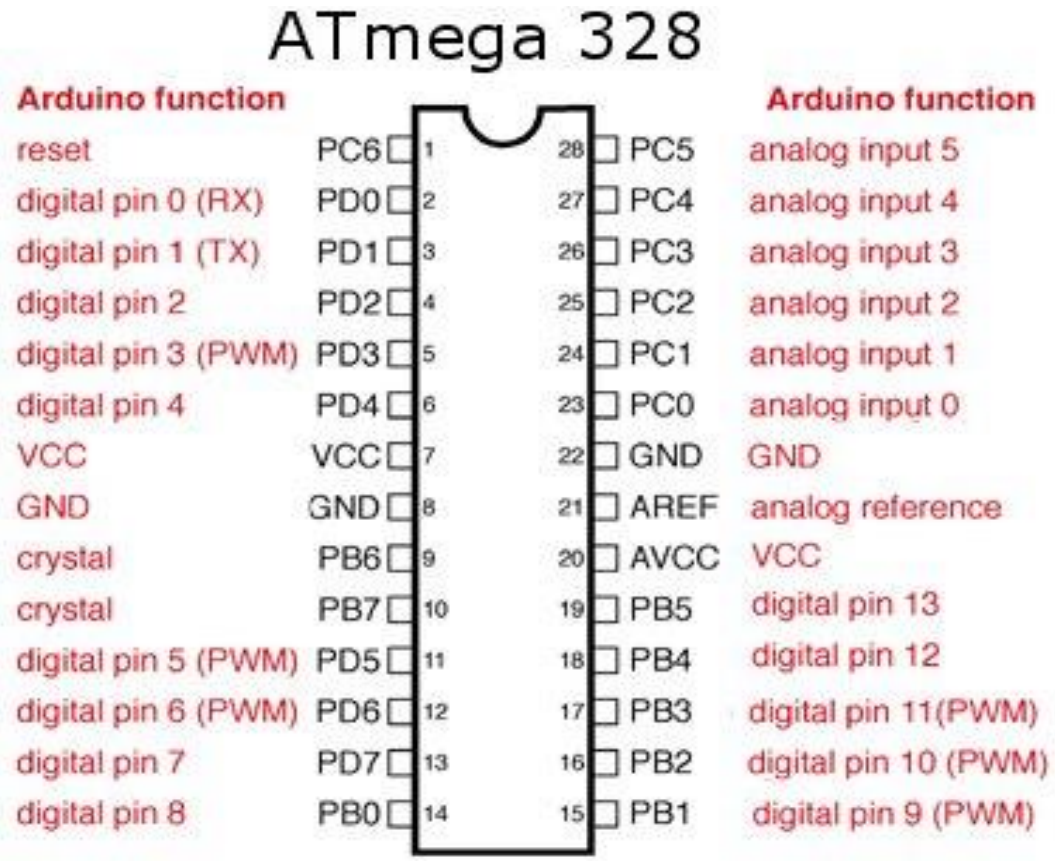
ARDUINO UNO



FEATURES

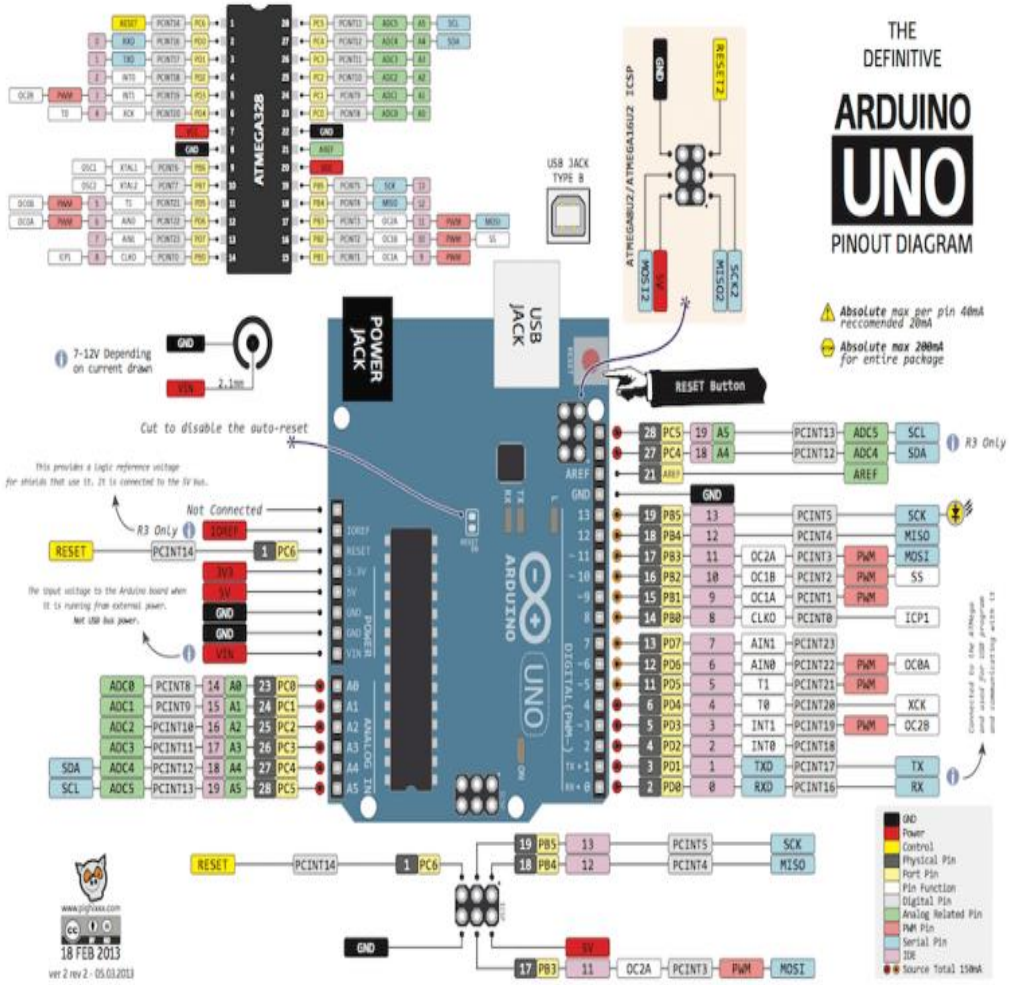
- Microcontroller: ATmega328
- Operating Voltage: 5V
- Uno Board Recommended Input Voltage: 7 -12 V
- Uno Bowl Input voltage Limits: 6 - 20V
- Digital I/O pins : 14 total; 6 of which are PWM
- Analog Input Pins: 6
- Maximum current per I/O pin at 5VDC: 40ma
- Maximum DC Current per I/I pin at 3.3 VDC: 50ma
- Flash Memory: 32KB (0.5KB used by boot loader)
- SRAM Memory: 2KB EEPROM: 110
- Clock Speed: 16 MHz

PROCESSOR PERIPHERALS (ATMEL ATMEGA 328)



- Two 8-bit Timer/Counters with Separate Prescaler and Compare Mode
- One 16-bit Timer/Counter with Separate Prescaler, Compare Mode, and Capture Mode
- Real Time Counter with Separate Oscillator
- Six PWM channels
- Six channel 10 bit. ADC including temperature measurement
- Programmable Serial USART
- Master/Slave SPI Serial Interface
- Byte-oriented 2 wire Serial interface (Philips 12C compatible)
- Programmable Watchdog Timer with Separate On-chip Oscillator
- On-chip Analog Comparator

INTERNAL DIAGRAM



GSM SIM 900A Module

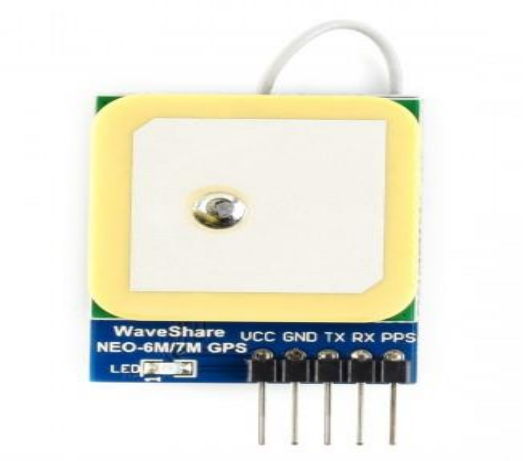
Features of SIM 900A:

- Single supply voltage: 3.4V – 4.5V
- Power saving mode: Typical power consumption in SLEEP mode is 1.5mA
- Frequency bands: SIM900A Dual-band: EGSM900, DCS1800. The SIM900A can search the two frequency bands automatically. The frequency bands also can be set by AT command.
- GSM class: Small MS
- GPRS connectivity: GPRS multi-slot class 10 (default) , GPRS multi-slot class 8 (option)
- Transmitting power: Class 4 (2W) at EGSM 900, Class 1 (1W) at DCS 1800
- Operating Temperature: -30ºC to +80ºC
- Storage Temperature: -5ºC to +90ºC
- DATA GPRS: download transfer max is 85 Supports single SIM card
- Firmware upgrade by debug port
- Communication by using AT commands
- Upload transfer max 42.8KBps
- Supports CSD, USSD, SMS, FAX
- Supports MIC and Audio Input
- Features keypad interface
- Supports UART interface
- Supports real time clock

PIN CONFIGURATION

Interface	Pin	Description
RST	1	Reset the SIM900 module
P	2	Power switch pin of SIM900 module
Tx	3	UART data output
Rx	4	UART data in
DT	5	Debug UART data output
DR	6	Debug UART data input
-	7	GND
+	8	VCC

UART GPS NEO-6M MODULE



This is a complete GPS module that is based on the Ublox NEO-6M. This unit uses the latest technology from Ublox to give the best possible positioning information and includes a larger built-in 25 x 25mm active GPS antenna with a UART TTL socket. A battery is also included so that you can obtain a GPS lock faster.

FEATURES

- Ublox NEO-6M onboard, with high-gain active antenna
- IPX interface, for connecting different active antennas
- Chargeable backup battery, keeps the ephemeris data when power down, supports hot starts
- Onboard EEPROM for storing configuration information

Specifications

Receiver type:	50 channels, GPS L1(1575.42Mhz) C/A code, SBAS:WAAS/EGNOS/MSAS
Horizontal position accuracy:	2.5mCEP (SBAS:2.0mCEP)
Navigation update rate:	5Hz maximum (1HZ default)
Capture time:	Cool start: 27s (fastest)；Hot start: 1s

Tracking & Navigation sensitivity:	-161dBm
Communication protocol:	NMEA(default)/UBX Binary
Serial baud rate:	4800, 9600(default), 19200, 38400, 57600, 115200, 230400
Operating temperature:	-40℃ ~ 85℃
Operating voltage:	2.7V~5.0V(power supply input via VCC)
Operating current:	45mA
TXD/RXD impedance:	510Ohms

PIN CONFIGURATION:

UART GPS NEO-6M module pins	Serial module pins
VCC	3.3V/5V
GND	GND
TXD	RX
RXD	TX

PIR SENSOR

Fig: PIR Sensor Module

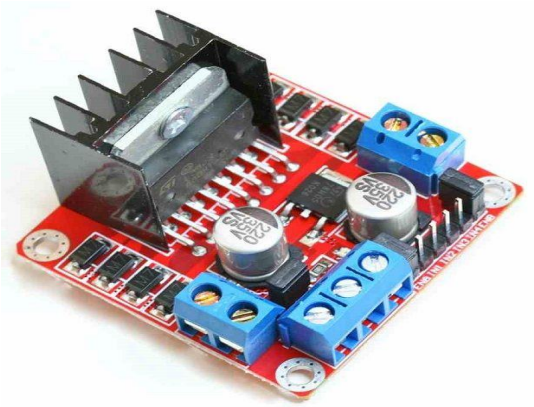
PIN CONFIGURATION

The pin configuration of the PIR sensor is shown in the figure. PIR sensor consists of three pins: Ground, Signal and power at the side or bottom. Generally, the PIR sensor power is up to 5v, but, the large size PIR modules operate a relay instead of direct output. It is very simple and easy to interface the sensor with a microcontroller. The output of the PIR is (usually digital output) either low or high.

SOME BASIC STATS OF PIR Sensor

- **Output:** Digital pulse high (3V) when triggered (motion detected) digital low when idle (no motion detected). Pulse lengths are determined by resistors and capacitors on the PCB and differ from sensor to sensor.
- **Sensitivity range:** up to 20 feet (6 meters) 110° x 70° detection range
- **Power supply:** 5V-12V input voltage for most modules (they have a 3.3V regulator), but 5V is ideal in case the regulator has different specs
- BIS0001 Datasheet (the decoder chip used)
- RE200B datasheet (most likely the PIR sensing element used)
- NL11NH datasheet (equivalent lens used)
- Parallax Datasheet on their version of the sensor

L298N MOTOR DRIVER

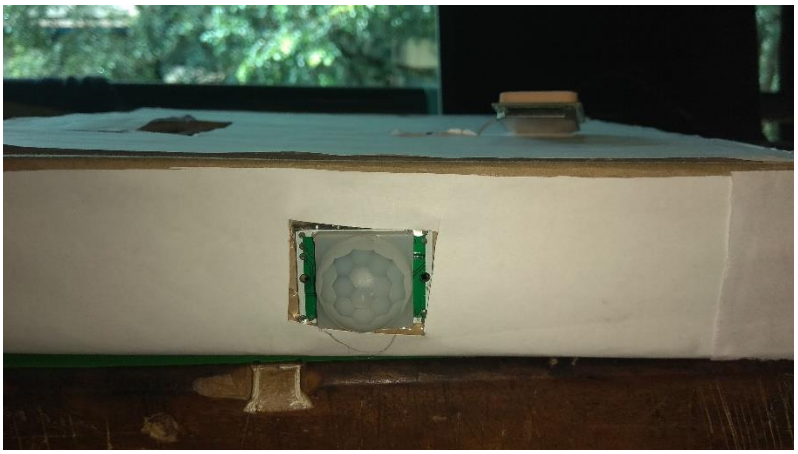


Pin Descriptions

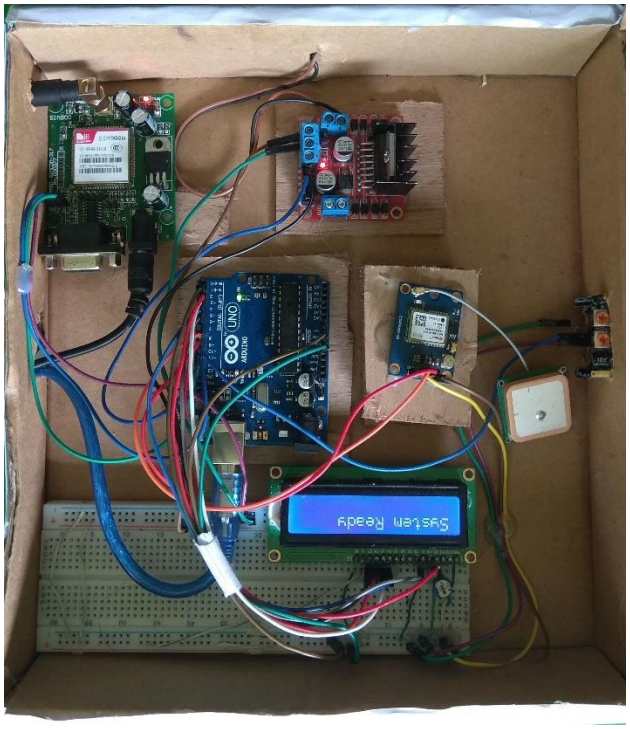
- Out 1: Motor A lead out 1
- Out 2: Motor A lead out 2
- Out 3: Motor B lead out 1
- Out 4: Motor B lead out 2
- GND: Ground
- 5V: 5V Logic Input
- EnA: Enables PWM signal for Motor A
- In1: Input for Motor A lead out 1
- In2: Input for Motor A lead out 2
- In3: Input for Motor B lead out 1
- In4: Input for Motor B lead out 2
- EnB: Enables PWM signal for Motor B
- Integrated 5V power regulator
- 2A max drive current

APPENDIX 2: PHOTO GALLERY

1. Project box with LCD Display and GPS antenna



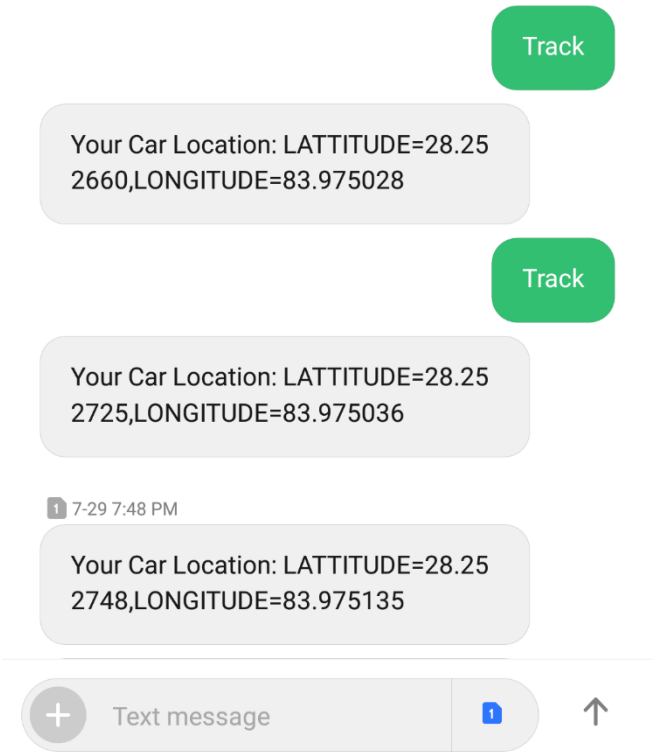
2. Side view of System with PIR sensor as intruder detector



3. System configuration with components in active state

4. Vehicle on drive

5. Vehicle on halt



6. Message box displaying GPS coordinate received on GSM SIM