ROAD SAFETY SYSTEM

by

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Department of Electronics
Quaid-i-Azam University, Islamabad

Certificate

It is certified that the work contained in this dissertation is carried out and completed by Miss Eurusha Pious under my supervision at Quaid-i-Azam University Islamabad, Pakistan.

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بِسْمِ اللَّهِ الرَّحْمَٰنِ الرَّحِيمِ

To our Beloved Department and University

Abstract

The project is based on an electronic Road Safety System; it can prevent automobile theft by using Global Positioning System (GPS) and Global System for Mobile (GSM) as the technology for the completion of the proposed system. This system provides security by using ignition cut off mechanism. GSM technology is used to assist the owner in critical situations like theft and accident. The module sends an alert message to the car owner if the ignition is switched on by an unauthorized person, then the owner can reply to the GSM module and switch off the ignition. The proposed system can perform the same operation in the case of rash driving and also in case of an accident to call emergency services.

Acknowledgments

I would like to thank Almighty Allah for His countless blessings and bounties. I would like to pay special gratitude, warmth and appreciation to the persons, who made our project successful and assisted us at every point to accomplish our goal.

Prof. Hasan Mahmood, our respected supervisor provided his generous support and guidance during this project. His encouragement made it possible to achieve the goal, his help and sympathetic attitude at every point during this project helped me to meet the deadline.

I humbly extend my thanks to all the staff members and lab attendants, whose services assisted our project to completion.

In the end, I am thankful to my family, especially my parents for their moral and financial support. I am grateful to my friends for their thought provoking questions and valuable ideas.

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CHAPTER 1

INTRODUCTION

The method of detecting illegal utilization of automobiles is called theft detection. This system increases the security and reliability of drivers in near future. It is a universal problem.

1.1 Theft detection

The designing of Theft detection system is used to prevent the ratio of stolen vehicles. This module not only alarms the car but also let the engine cease. The function of this module is to detect automobiles in case of theft, and then it will send an SMS to the owner which is automatically generated by the module.

1.1.1 Theft detection in Pakistan

Last year, according to police records about three thousand and eight hundred fifty-six (3,856), cars were stolen from Punjab. The untraced cars were almost five hundred ninety-eight (598). [Motor Insurer's Bureau (MIB)]

1.1.2 Statement of Problem

Many people show their irresponsible behavior regarding their life, properties and even the security of their automobiles. It is actually the responsibility of the owner of the vehicle, to protect it himself. Problems are faced by the citizens who are not aware of installing tracking device or anti-theft device in their vehicles [2]. As in developing countries like Pakistan, parking issues are faced due to which a person parks his car anywhere. This is also one of the major causes of the automobile theft so to easily connect with the owner and concerned emergency services.

1.1.3 Electronic module

The manufacturing cost of this module is very cheap, so mostly everyone in Pakistan can easily afford it. This is a very effective module, which helps the owner to protect his automobile. This module includes GSM and GPS. In this module, GSM and GPS receiver is controlling the entire functionality with the help of Arduino [3]. GSM is used to send and receive the SMS. GSM sends the message to Arduino and it compares the received message with the predefined message. If both the messages are matched, then it will send the message that contains the location of GPGGA (Online Decoder). It is beneficial for the owner that an automated system of the tracking vehicle is used.

1.2 Thesis Layout

This report contains a comprehensive study of the undergoing project discussing each and every step till completion. Chapter 2 gives a skimpy overview of the Arduino board. Chapter 3 explains functionality, architecture and features of GSM module. Chapter 4 and 5 discusses the configurations of GPS and ADXL335, and also presents how to interface them with the Arduino. Chapter 6 describes the working of the entire project. At the end, chapter 7 entitled conclusions and future improvements that can be made in this project.

CHAPTER 2

ARDUINO

Overview

Arduino is an open source microcontroller board based with microcontroller chip on it. It is used to interface hardware and software simultaneously. It has digital and analog input and output pins that are connected to circuits through various expansions of bread boards. It is used to interface with the sensors. It has 14 digital pins and 6 analog pins. It contains of reset button, power jack and USB connections.

2.1 Specifications of Arduino UNO

Arduino has 14 digital pins and it has 6 analog pins. It have power pin of different voltage categories like 5V and 3.3V as well as a ground pin (GND), V_{IN} and Reset pins. It has a USB Port to communicate with the computer. It has an oscillator and a flash memory of 32 KB to store programs. An external voltage source is also mounted on Arduino board which is known power jack. Its voltage varies 7-12V. ATmega328 microcontroller is embedded on the Arduino board.

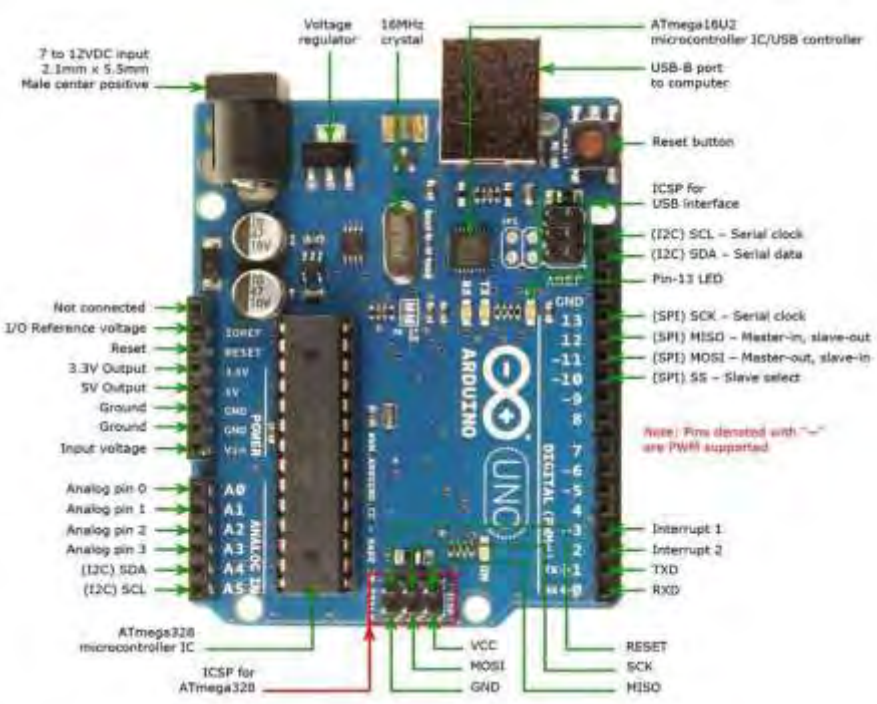

Figure 2.2 Components of Arduino UNO

2.2 Pin Configuration of Arduino UNO

2.2.1 Power Pins

There are three power pins embedded on the board. 5 volts can be supplied to Arduino, through 5V pin. 3.3 volts can be supplied to Arduino, through 3.3V pin. There is also an option of providing external voltage to the Arduino board through V_{IN} pin. Also there are ground pins which are used to provide ground to the board.

2.2.2 Input/output Pins

Arduino consists of digital input/output pins as well as simple to computerized converter pins. There are total 20 pins which can be made input or output pin but one at one time. Out of these, 14 are digital pins while the other 6 are analogs pins. Digital pin 0 (Rx) is used for receiving of bits and digital pin 1 (Tx) is used transmitting of bits. By default, each pin is considered as input pin. We can assign the pins either input or output with the use of built in function "pinMode" in programming.

The format which is used for indicating input/output pins are written below:

```
pinMode(3,OUTPUT);
digitalWrite(2,LOW);
```

For reading analog data A0, A1, A2, A3, A4 and A5 pins are used. Analog pins are also used to read sensors data. The format using built in functions is written below:

```
pinMode(A0,OUTPUT);
digitalMode(A0,LOW);
```

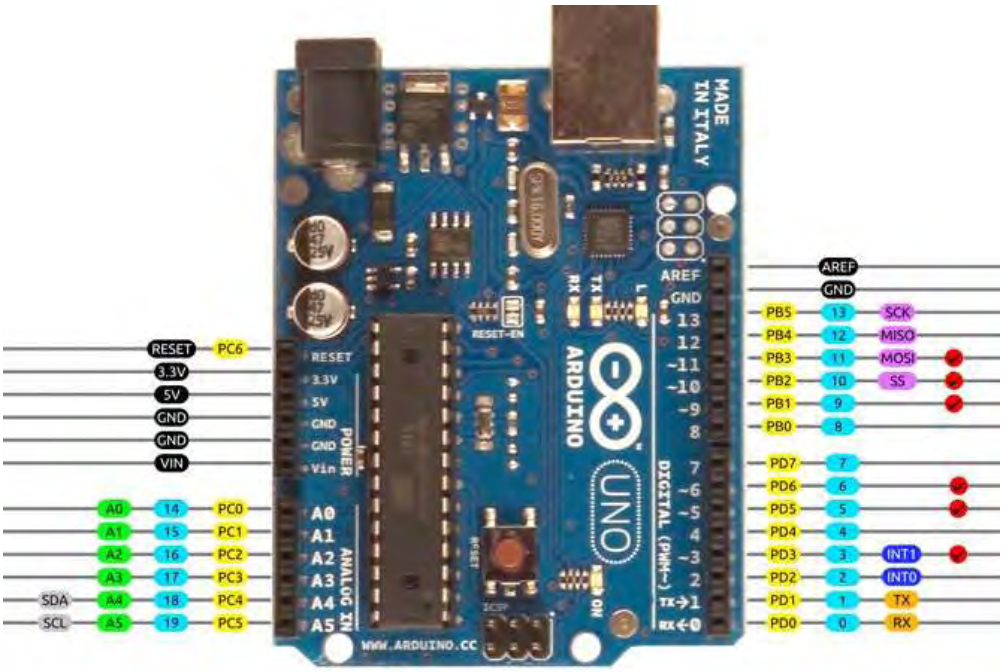

Figure 2.3 Pin Configuration of Arduino

2.3 Arduino Connections to Computer

For interfacing Arduino Uno to the computer, we require a USB cable and Arduino IDE software. The port of Arduino board is connected to the USB port of the computer or laptop through the cable. The connection of Arduino board to the computer can be identified by the blinking of "ON" led of Arduino board. Serial ports and board are selected in Arduino IDE software. A code example can be uploaded for checking the connections. But before uploading, serial ports should be selected appropriately. Then we can upload the program.

2.4 Arduino UNO (Programming):

2.4.1 Language

In Arduino Uno C++ programming language is used. This language is human readable and easily understandable.

2.4.2 Arduino IDE

Arduino IDE (Integrated Development Environment) is open source software developed by a company named Arduino. It primarily uses C and C++ languages. We can write a code and upload it to the board. Also, we can make changes in our written code whenever needed.

2.5 Beginners and Arduino

Interfacing and programming of Arduino is very easy to handle. There are lot of libraries and tutorials available on the internet regarding this. Beginners as well as experts are taking advantage of this easily applicable module. Many examples and codes of Arduino are available in the Arduino IDE software.

CHAPTER 3

GSM MODULE

Overview

Global System for Mobile (GSM) is a module of communication which is able to transmit and receive signals. This mobile communication is quite popular around the world. GSM is a cellular technology from which we can transmit mobile voice and data services. There are multiple access techniques of communication while GSM uses the time division multiple access (TDMA) technique. A GSM can minimize and digitize the provided data and send it with the help of a channel in specific time slots. The data carry rate is between 64 kbps to 120 kbps. It consists of different cell sizes. Cell sizes are measured in pico meter, micro meter and macro meters. The implementation of every cell is different and the area of coverage of every cell is different with respect to the implementation of environment.

Figure 3.1 SIM900a GSM Module

3.1 Network Architecture of GSM

Network of GSM is explained in next page

3.1.1 Mobile Station

A mobile station is a mobile phone in which processor, display and transceiver is present. Transceiver is used to transmit the data for communication purposes. The processor controls the display and transceiver of mobile. Mobile station consists of two components.

Mobile Equipment: Class mark of mobile equipment is sent to network as an initial message. Class mark carries the information to the mobile station.

Subscriber Identity: Subscriber parameters are carried by SIM. In SIM the PIN (Personal Identification Number) has a four-digit PIN code. It is internal protection of SIM of being illegal use. When the three wrong entries entered to the mobile, SIM card blocks automatically and PUK (Personal Unblocking) the SIM is unblocking by eight digit code.

3.1.2 Base Station Subsystem (BSS)

Mobile station and network station are linked through the base station system. There are three main components of base station subsystem, base site controller (BSC), base transceiver station (BTS) and transcoder. There are 40 base transceiver stations which come under single base site controller. Information is carried out and from base transceiver station by the base site controller. The base site controller relates the two channels included air interface and terrestrial circuits. Base station controller is the medium through which mobile switching center (MSC) and Base transceiver station. Base transceiver station is a hardware which is responsible for control of functionality. It consists of 1 - 6 carrier cabinets and it can perform 48 calls which are simultaneously taken. It contains two major parts.

Base Transceiver Station: It can modulate the radio frequency signals. The process of multiplexing is done through antenna for sending and receiving signals. The data can be received and transmitted in it. The source of communication helps to relate base transceiver station to mobile station.

Base Station Controller: It helps the base transceiver station in managing radio resources. The time slots and frequencies are provided to all mobile stations covering its area through base station controller. The process setup calls and transcoding are performed in it. It can communicate with mobile switching center as well as with base transceiver station.

3.1.3 Network Switching Subsystem

It connects the mobile stations to the basic network. Mobile switching center can access various networks. Call roaming and call routing of GSM are handled through this network. Mobile switching center can switch the calls and support them by preforming operations. It also receives the call data. Accounts of mobile equipment are managed by equipment identity register and any mobile can be identified by the international mobile equipment identity (IMEI). It contains five parts which are explained below:

Mobile Switching Centre: It is a core of the network. It is a source of communication between GSM and other networks. It performs functions such as call setup, basic switching and routing. It helps to provide the information of billing. It behaves as an interface for users of Visitor Location Register (VLR), who roam to different networks.

Home Location Register: All subscribers relay to home location register. The database of HLR is subscribed through the supplementary services and also gives the supplementary information for forwarding the address.

Visitor Location Register: The main purpose of this register is to control the roaming of mobiles in areas near to it. The queries are reduced to HLR through a visitor location register. It controls area authentication key and different locations.

Authentication Centre: When air interface is affected by the intruders, so it gives protection. It works for algorithms and authentication keys.

Equipment Identity Registry: It helps to track handsets with the help of international mobile equipment identity (IMEI) number. It is divided into three subclasses; Gray List, Blacklist and White List.

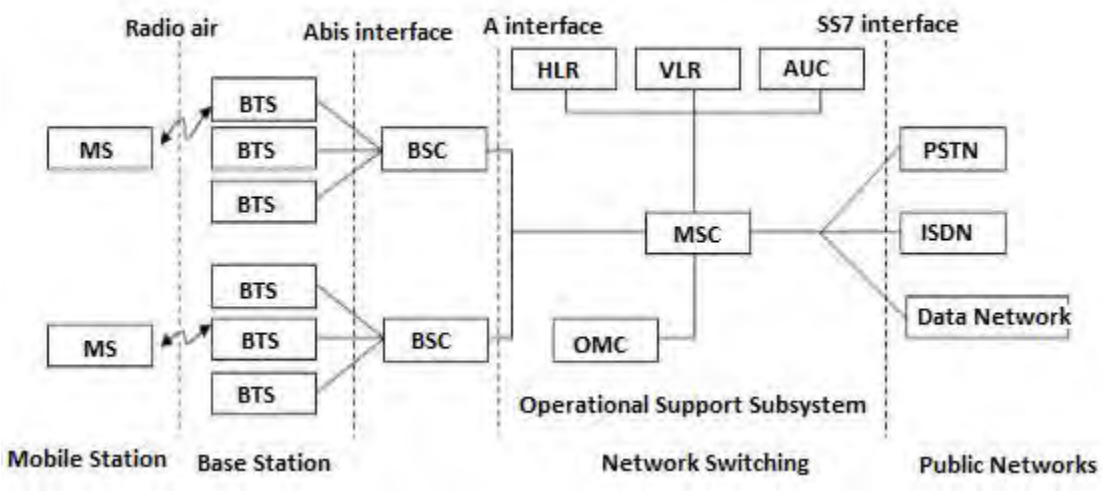

Figure 3.2: Network Architecture of GSM

3.2 Pin Layout of GSM Sim900a Module

3.2.1 Power Pins

Pin 2 and 3 VBAT is the main input power supply. It should be provided voltage range of 3.5V to 4.3V. Pin 6 (VDD-EXT) is used to provide the voltage to 2.8V. It can supply power for input/output shifting circuits. The current passing through this module must be less than 50mA. Pin 1, 4, 15, 20 and 26 (GND) are used to ground the circuitry. Pin 19 (ON/OFF) is responsible for the input and to initiate the working or not. Pin 18 (RESET) is resets the low-level pulse.

3.2.2 SIM Card and UART Interface Pins

Pin 7 (URXD) is responsible to receives the universal asynchronous receiver transmitter (UART) data. Pin 8 (UTXD) is used to transmit the UART data. Pin 24 (HOST-RX) is used to host the received data. Pin 25 (HOST-TX) is used to host the transmitted data. These two pins 24 and 25 are used to upgrade the module. Pin 11, 12, 13 and 14 (SIM-Pins) are responsible of input/output maintains in SIM card in SIM-Data pin 11. The clock output of this SIM card is controlled by SIM-Clock pin 12. To reset the SIM card output SIM-Reset pin 13 is used. For supplying the output power to SIM card VSIM pin 14 is used.

3.2.3 LED, ADC, Control, Audio and Reserved Pins

Pin 5 (LIGHT) is LED indicator pin which shows the status of the LED. Pin 10 (RING) deals with the RING output and it is also the LED indicator pin. Pin 16 (ADC-IN) is the input pin of analog signal which detects the analog to digital converter input of 10 bits. Pin 21 (GPRS-ANT) is used as an interface of GPRS antenna and impedance of 50 ohms. Pin 9 (DTR) is an analog input analog pin which can generate the signals to control the GSM for going into sleeping mode. Pin 22 and 23 are responsible for MIC input and MIC output of positive electrodes. Pin 17 and 27 are reserved pins. These are not connected to any circuitry and in simple words we can say that these pins are not for use.

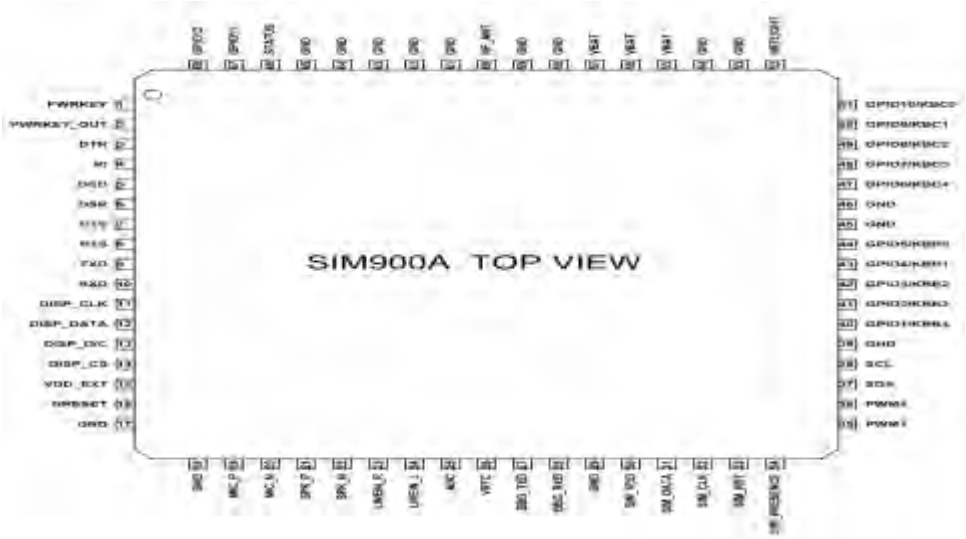

Figure 3.3 Pin Configuration of GSM

3.3 Features of GSM Module

GSM works on dual and quad bands frequencies. It has Sensitivity level of -107dBm. The maximum transmission power is 1 Watt to 2 Watt. It is providing instantaneous current of 2 Ampere. It has Operating current of 210mA. The sleep mode current is about 2.5mA. It can work

on the temperature -40 degree centigrade to +85 degree centigrade. The range of operating voltage is 3.3V to 4.4V but 3.9 is recommended voltage.

CHAPTER 4

GPS MODULE

Overview

Global Positioning System (GPS) is a steering system based on the satellite. It works in any type of weather dry, wet and rainy in around the world, for 24 hours without any subscription charges. The department of defense (DOD) of united state spread the satellite system into orbit for the use of military purposes but this is also available for commercial uses in 1980s. The satellite covers earth twice a day. These satellites are transmitting signals to parameters of orbit and provide a facility to GPS module to compute the exact or near to exact location. At least three satellites signals can help GPS receiver to operate. If we want 3D location, GPS module must be connected with the four or more satellites. GPS determine the other information like speed and knot. The technique which is used by satellites are CDMA (code division multiple access).

Figure 4.1 GPS Module

4.1 Hardware Module of GPS

4.1.1 NEO6M GPS Chips

The core of the module is NEO6M GPS chip. This chip is small in size and has many features in it. To achieve high level sensitivity, we can track up to 22 satellites with 50 channels and current supply of 45mA. It can update the 5 locations with accuracy of 2.5m in horizontal position. It boasts Time to First Fix (TTTF) in one second. This chip can save the power called power save mode (PSM). The receiver of switching parts of it can on and off by reducing the

power consumption so we can say that it is a power sensitive module. The pin of GPS needs to communicate with the microcontroller. The band rate of this mode is from 4800bps to 230400bps where 9600 is the default baud.

4.1.2 LED Indicator

The status of the current position can be indicated by the led on the GPS module. It blinks depending on the state of the GPS? When it is not blinking it means that it is in the process of connecting to the satellites and when it is blinking with a time delay of one second it means the fix position is found which indicates that this module can search enough satellites.

4.1.3 LDO Regulator (3.3V)

The voltage by which the GPS operates is range from 2.7 - 3.6V, but this module generates very low voltage dropout. Without using any logic level converter, we connect the GPS to the Arduino with logic pins of 5 volts tolerant.

4.1.4 EEPROM and Battery

The GSM module has Battery for power backup and Electrically Erasable Programmable Read Only Memory (EEPROM) for storing configuration settings. It consists of module configuration, clock data and latest positive data but it could not store data permanently. When clock is retains by the battery, time to First Fix (TTTF) can be reduce to one second. This can help to find position as fast as it can. The battery is charge by itself to maintain data for two weeks.

4.1.5 Antenna

Antenna is used specially for communication. The sensitivity of antenna is 161dBm.

4.2 Interface of GPS with Arduino

The library named TinyGPS is installed in the Arduino IDE to interface the module properly. This module has external antenna. For connecting GPS module and Arduino, power supply of 5 Volts and ground should be provided. We can use two pins Rx and Tx, which works for serial communication. Rx pin is used for receiving data. Tx pin is used for transmitting data.

4.3 Features of GPS Module

By using independent GPS receiver, the position fetching is performed in less than one second. The tracking sensitivity is about 162dBm. It has anti-jamming technology. There are 50 positioning system of channel. A Time delay is required to locate the position. It updates the position range in more than 5Hz. The range of temperature to operate is 40 degree centigrade to 85 degree centigrade. It saves the setting from EEPROM.

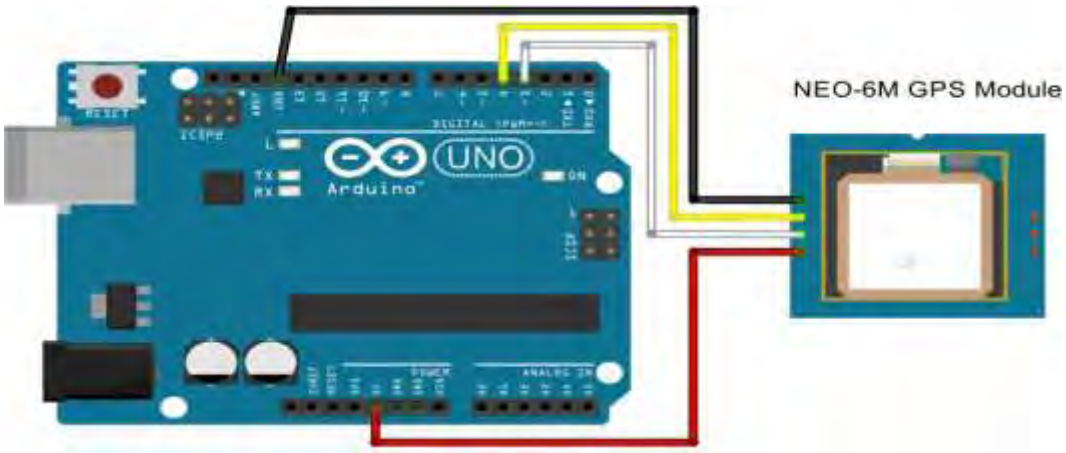

Figure 4.2 GPS Interfacing with Arduino

4.4 Pin out for GPS Module

There are five pins of GPS which are explained in this paragraph. GND Pin and V_{CC} are used to provide power backup to the module. TXD Pin is a transmitter pin which is use for serial communication. RXD Pin is receiver pin is also use for serial communication.

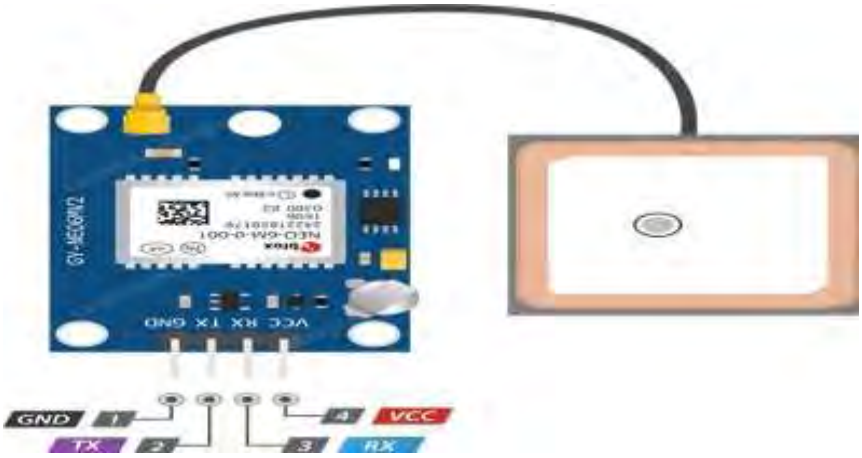

Figure 4.3 Pin Configurations of GPS

CHAPTER 5

ACCELEROMETER (ADXL335)

Overview

Accelerometer is a device of electro-mechanics which is used to measure proper acceleration. This acceleration should be in a fixed coordinate system, for example the fix value of gravity attracted everything towards earth. It can follow in a dynamic manner, for example vibration of different objects. We can use accelerometer for the measurement of static acceleration due to gravity to find different angles of various objects with respect to constant force of gravity. We analyze the sense of dynamic acceleration that how an object is moving.

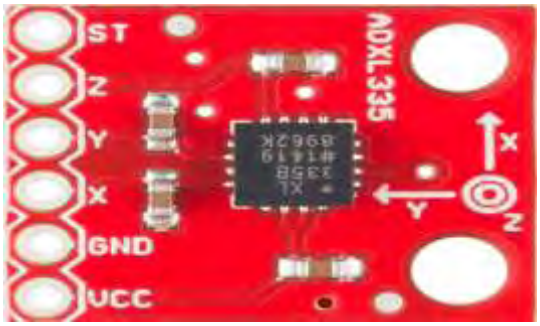

Figure 5.1 ADXL 335

5.1 ADXL335

The ADXL335 is an accelerometer, which works on the piezoelectric effect. It is small in size. It operates on low power. It is used for three-dimensional axis. It can be used to sense the applications for static acceleration of gravity. It can measure the dynamic acceleration caused by vibration, shock or tilt. ADXL335 is a low power sensor and it can operate on 3.3V. It can sense acceleration in each dimension i.e. analog. We can also convert the readings into digital form with the use of analog to digital converter. For this purpose, Arduino can be used.

5.2 Features of ADXL335

It is a Low and small profile package. It has a brilliant sense of temperature. It senses acceleration in three dimensions/ axis. It can operate on a single supply voltage range from 1.8V to 3.8V.The size of sensor is 4mm×4mm×1.45mm.

5.3 Connections of Pins

VCC Pin is used to supply 3.3 volts GND pin is connected to the ground. It is necessary to power on the Arduino. X-OUT pin is an analog pin for output used for acceleration in specific x-direction and analog port of Arduino is connected to this pin. Y-OUT pin is used for acceleration in y-direction this output pin is used. Z-OUT pin is used for the acceleration in z-direction.

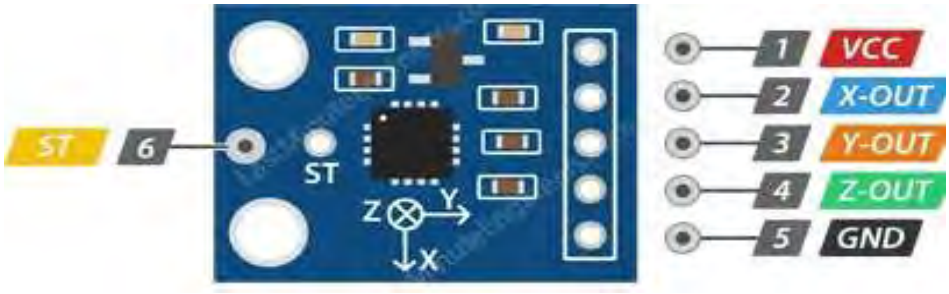

Figure 5.2 Pin Configurations of ADXl33

CHAPTER 6

WORKING MECHANISM

Explanation

By using the components explained in previous chapters, we insert the key and switch on the vehicle, then through mobile App, we can send the SMS to the system module. The mobile App is responsible to send commands and these commands are already defined in module. The commands are defined such as “engine off “and “engine on” are used to control the engine. First of all, reset the Arduino Uno, we required that led of GPS is blinking, which is sign GPS initialization. The LED of GPS should blink if it is not in blinking mode, so the GPS data is not getting the position. After that GPS data is shown on 16×2 LCD. The blinking of GPS indicates longitude and latitude of GPS regarding of its position. 16×2 LCD display that the GPS is initialize. The next part is to initialize the GSM module. LCD display will show that the GSM is initialized [4]. While the entire system is in progress of initialization so at that time no key is inserted. At that time, the system will be in a normal condition. By using this module, it is completely dependent upon the owner whether he can on or off ignition system. By switching ignition system on and off our vehicle gets on and off. There are three main objectives theft, rash driving and accident detecting.

When the key is inserted by any unauthorized person, the buzzer will immediately start beeping. Arduino Uno extract the location coordinates from GPS. With the help of GSM, a message “Somebody taken the vehicle location coordinates Latitude XXYYZZ, N Longitude AABBCC, E” will be generated. By using Google map we can easily trace the vehicle. Owner has such authority that to stop the engine of the vehicle and send the data to the GSM. Arduino sense the command and stop the supply of the engine. When the supply of the engine becomes off then any person cannot able to start the vehicle. Now GSM will again send message to the owner that engine is stopped and also give the information of location [5].

This module has another functionality of sensing the Rash driving. We already defined reference values of normal situation in the module. If a car is driven rashly then Arduino will extract values from ADXL335 and compare these values to reference values. If this condition does not fulfill then the message is generated with location of vehicle and send to it to owner [6]. Now it is dependent on owner whether he can switch vehicle on and off supply engine.

Another main functionality of the module is sensing accident. For this purpose, it will sense the sudden change happens in any axis of ADXL335 like X, Y and Z axis [7]. When an incident like accident happens then car gets tilt. Through ADXL335, sudden changed axis values of tilted vehicle will be extracted by Arduino. These values are compared by Arduino and check whether if any change occurs, then Arduino will extract longitude and latitude from GPS module [10].location would be sent by a SMS to the defined number, which will be used to call emergency services. So from that we can easily rescue the passengers.

Source Code

```
#include<LiquidCrystal.h>
LiquidCrystal lcd(8, 9, 10, 11, 12, 13);/////LCD CONNECTIONS
#include <SoftwareSerial.h>
SoftwareSerial gps(3, 4); // RX, TX
const int key=5;   /////////////////L1
int keyalert=1;          // variable for reading the pushbutton
status
int i=0;   /////VARIABLE
int temp=0;  /////  VARIABLE
int  gps_status=0;///// VARIABLE
float latitude=0;/////GPS  LAT VALUE VARIABLE
float logitude=0;/////GPS  LONG VALUE VARIABLE
String gpsString="";   ///GPS STRING STORAGE
char *test="$GPRMC";   /// GPRMC GLOBAL POSTION SYSTEM WITH LAT
AND LONG VALUE
////////////////////////////////////////////////////////////////
/
int fan = 7; //Connect LED 1 To Pin #D6 ////////motor
int BUZZ = 6; //Connect LED 2 To Pin #D3 ///////buzzer
////////////////////////////////////////////////////////
////SENSOR  DATA  VARIABLE TO STORE VALUES
unsigned int MEMSX;
unsigned int MEMSY;
/////////////////////////////////////
int ii=0;
int aa=0;int bb=0;
int led=2;///MESSAGE CHECKING LED
char str[15];  ///  MOBILE NUMBER WITH   STRING COMPARISION
////////////////////////////////////////////////////////////////
//////////////////////////////////////////////////////
void initModule(String cmd, char *res, int t)
{

while(1)
{
Serial.println(cmd);
delay(100);
while(Serial.available()>0)
{
if(Serial.find(res))
'
if(Serial.find(res))
{
Serial.println(res);
delay(t);
return;
}
```

```
}
else
{
Serial.println("Error");
}
}
delay(t);
}
}
////////////////////////////////////////////////////////////////////////
//////////////////////////////
void serialEvent()
{
while(Serial.available())
{
if(Serial.find("#S."))
{
digitalWrite(led, HIGH);
delay(1000);
digitalWrite(led, LOW);
while (Serial.available())
{
char inChar=Serial.read();
str[ii++]=inChar;
if(inChar=='*')
{
temp=1;
return;
}
}
}
}
}
////////////////////////////////////////////////////////////////////////
//////////////////////
void setup()
{

 lcd.begin(16, 2);/////16X2 LCD DISPLAY INTILIZATION
 Serial.begin(9600);/////GSM MODEM DISPLAY INTILIZATION
 gps.begin(9600),/////GPS MODEM DISPLAY INTILIZATION
 pinMode(fan, OUTPUT); ///FaN OUTPUT
 pinMode(BUZZ, OUTPUT); ////BUZZ OUT PUT
 pinMode(key, INPUT);
 digitalWrite(fan,LOW);  /// FAN LOW OFF
 digitalWrite(BUZZ,LOW);///BUZZER LOW OFF
```

```
lcd.clear();///LCD CLEAR SCREEN
lcd.setCursor(0,0);////FIRST LINE LO FIRST LETTER WITH
ADDRESS
lcd.print("VEHICLE THEFT");////DISPLAY DATA ON TO THE LCD
SCREEN
lcd.setCursor(0,1);////SECOND LINE LO FIRST LETTER WITH
ADDRESS
lcd.print("DETECTION USING");
delay (5000);//////DELAY 5SEC
lcd.clear();///LCD CLEAR SCREEN


lcd.setCursor(0,0);
lcd.print("GSM , GPS AND");
lcd.setCursor(0,1);
lcd.print("ARDUINO UNO R3");
delay (5000);
lcd.clear();

lcd.setCursor(0,0);
lcd.print("Waiting For GPS");
lcd.setCursor(0,1);
lcd.print(" Signal    ");
get_gps();////////////////////////  CORRIDATE COLLECTION OF
LAT AND LONG
show_coordinate();/////LCD DISPLAY ON COORDING NATES SHOWING
delay(3000);
lcd.clear();

lcd.setCursor(0,0);
lcd.print("GPS Initialized");        ///
delay(1000);
lcd.clear();

lcd.print("Initializing");
lcd.setCursor(0,1);

lcd.print("GSM MODEM");
delay(1000);
initModule("AT","OK",1000);//////AT IS CALLED AS ATTECTION
COMMAND
initModule("ATE1","OK",1000);
initModule("AT+CPIN?","READY",1000); //////CPIN?   SIM CARD
READY
initModule("AT+CMGF=1","OK",1000);   //////AT+CMGF=1   TEXT
MODE
initModule("AT+CMGD=1,4","OK",1000); //////  AT+CMGD=1,4
DELETE ALL SMS IN SIM CARD
initModule("AT+CNMI=1,1,0,0,0","OK",1000); ///////REDING SMS
FROM SIMCARD
```

```
lcd.clear();
lcd.print("Initialized");
lcd.setCursor(0,1);
lcd.print("Successfully");
delay(2000);
lcd.clear();

lcd.clear();
lcd.setCursor(0,0);
lcd.print("OPEN ENGINE APP & ");
lcd.setCursor(0,1);
lcd.print("Perform Action ");
delay(2000);
}

////////////////////////////////////////////////////////////////////////////
////////////////////////////////////////////////////////////////
void loop()
{st:

if(temp==1)
{
check();
temp=0;
ii=0;
delay(500);
}
lcd.clear() ;

keyalert = digitalRead(key);
if (keyalert == LOW)
{
lcd.setCursor(0,0);
lcd.print("NO KEY       ");
lcd.setCursor(0,1);
lcd.print("DETECTED        ");
delay(1000);

}
else
{
  if(bb==0)
  {
lcd.setCursor(0,0);
lcd.print("     KEY        ");
lcd.setCursor(0,1);
lcd.print("DETECTED         ");
digitalWrite(BUZZ,HIGH);delay(1000);
aa=aa+1;
if(aa==1)
{lcd.clear();delay(100);
lcd.setCursor(6,0);lcd.print("ENGINE ON ");delay
(500);digitalWrite(fan,HIGH);digitalWrite(BUZZ,LOW);
lcd.clear();lcd.print("Sending SMS ");delay(1000);Sends
();delay(1000);
goto st;
```

```
}
lcd.clear() ;
MEMSX = analogRead(0);MEMSX=MEMSX/2;delay(500);// half the
value and paste it to variable
MEMSY = analogRead(1);MEMSY=MEMSY/2;delay(500);//
////////////////////////////////////////////////////////////////////
////////////////////////////////////
if(((MEMSX >= 170) & (MEMSX <= 195)) &  ( (MEMSY >= 170) &
(MEMSY <= 195 )) )// `normal condition mei move kr ri auto
{
lcd.setCursor(6,0);lcd.print("ENGINE ON ");delay
(500);digitalWrite(fan,HIGH);digitalWrite(BUZZ,LOW);
}
////////////////////////////////////////////////////////////////////
////////////////////////////////////////////////
if(((MEMSX >= 130) & (MEMSX <= 150)) &  ( (MEMSY >= 170) &
(MEMSY <= 175 )) )
{
lcd.setCursor(6,0);lcd.print("ACCIDENT   ");lcd.setCursor
(6,1);lcd.print("DETECTED ");
delay(2000);lcd.clear();lcd.print("Sending SMS ");delay
(2000);Send1();delay(2000);goto st;
}
////////////////////////////////////////////////////////////////////
////////////////////////////////////////////////
if(((MEMSX >= 185) & (MEMSX <= 200)) &  ( (MEMSY >= 160) &
(MEMSY <= 175 )) )
{
lcd.setCursor(6,0);lcd.print("ACCIDENT   ");lcd.setCursor
(6,1);lcd.print("DETECTED ");
delay(2000);lcd.clear();lcd.print("Sending SMS ");delay
(2000);Send2();delay(2000);goto st;
}
////////////////////////////////////////////////////////////////////
////////////////////////////////////////////////////////

 if(((MEMSX >= 160) & (MEMSX <= 175)) &  ( (MEMSY >= 180) &
 (MEMSY <= 195 )) )
 {
 lcd.setCursor(6,0);lcd.print("ACCIDENT   ");lcd.setCursor
 (6,1);lcd.print("DETECTED ");
 delay(2000);lcd.clear();lcd.print("Sending SMS ");delay
 (2000);Send3();delay(2000);goto st;
 }
 ////////////////////////////////////////////////////////////////////
 ////////////////////////////////////////////////////////
 if(((MEMSX >= 160) & (MEMSX <= 175)) &  ( (MEMSY >= 130) &
 (MEMSY <= 150 )) )
```

```
{
lcd.setCursor(6,0);lcd.print("ACCIDENT     ");lcd.setCursor
(6,1);lcd.print("DETECTED ");
delay(2000);lcd.clear();lcd.print("Sending SMS ");delay
(2000);Send4();delay(2000);goto st;
}
////////////////////////////////////////////////////////////////////
////////////////////////////////////////////////////////////
}
}
}
////////////////////////////////////////////////////////////////////
////////////////////////////////////////////////////////////
void check()
{
//////////////////////////////////////////////////////
if(strncmp(str,"#S.engineon*",12))
{
lcd.clear();lcd.setCursor(0,0);
lcd.print("ENGINE ON");digitalWrite(fan, HIGH);//////HIGH IS
ON
delay(1000);
}
////////////////////////////////////////////////////////////////////
else if(strncmp(str,"#S.motoroff*",12))
{
lcd.clear();
lcd.setCursor(0,0);
lcd.print("ENGINE OFF");digitalWrite(fan,LOW);//////LOW IS
OFF
}
////////////////////////////////////////////////////////////////////
else if(strncmp(str,"#S.vechstop*",12))
{
lcd.clear();
lcd.setCursor(0,0);
lcd.print("ENGINE OFF");digitalWrite(fan,LOW);
`
void gpsEvent()
{
gpsString="";
while(1)
{
while (gps.available()>0)  //Serial incoming data from GPS
{
char inChar = (char)gps.read();
gpsString+= inChar;  //store incoming data from GPS to
temparary string str[]
i++;
```

```
if (i < 7)
{
if(gpsString[i-1] != test[i-1])  //check for right string
{
i=0;
gpsString="";
}
}
if(inChar=='\r')
{
if(i>60)
{
gps_status=1;
break;
}
else
{
i=0;
}
}
}
if(gps_status)
break;
}
}
////////////////////////////////////////////////////////////////////
//////
void get_gps()
{
lcd.clear();
lcd.setCursor(0,0);
lcd.print("Getting GPS Data");
lcd.setCursor(0,1);
lcd.print("Please Wait.....");
gps_status=0;
int x=0;
while(gps_status==0)
{
gpsEvent();
int str_lenth=i;
coordinate2dec();
i=0;x=0;
str_lenth=0;
}
}
////////////////////////////////////////////////////////////////////
////////////////
```

```
void show_coordinate()
{
lcd.clear();
lcd.setCursor(0,0);
lcd.print("Lat:");
lcd.print(latitude);
lcd.setCursor(0,1);
lcd.print("Log:");
lcd.print(logitude);
delay(2000);
lcd.clear();
}
////////////////////////////////////////////////////////////////////////
//////////////////////////////

void coordinate2dec()
{
String lat_degree="";
for(i=19;i<=28;i++)
lat_degree+=gpsString[i];
String lat_minut="";
for(i=28;i<=32;i++)
lat_minut+=gpsString[i];
String log_degree="";
for(i=32;i<=34;i++)
log_degree+=gpsString[i];
String log_minut="";
for(i=35;i<=41;i++)
log_minut+=gpsString[i];
float minut= lat_minut.toFloat();
minut=minut/60;
float degree=lat_degree.toFloat();
latitude=degree+minut;
minut= log_minut.toFloat();
minut=minut/60;
degree=log_degree.toFloat();
logitude=degree+minut;

void init_sms1()
{
Serial.println("AT+CMCF=1");delay(400);
Serial.println("AT+CMGS=\"+923485004239\"");    // use your 10
digit cell no. here
delay(400);
}
////////////////////////////////////////////////////////////////////////
//////////////////////
void send_data(String message)
{ Serial.print(message);delay(200);}
////////////////////////////////////////////////////////////////////////
```

```
void lcd_status()
{lcd.clear();lcd.print("Message Sent");  delay(500);return;}
////////////////////////////////////////////////////////////////
//////////////////
void VEHICLE()
{
Serial.println(" Vehicle's Geographic Position (");delay
(500);
Serial.print("Latitude:");Serial.print(latitude,6);send_data
(",N\n");
Serial.print("Longitude:");Serial.print(logitude,6);send_data
(",E\n");
Serial.print(latitude,6);Serial.print(",");Serial.print
(logitude,6);Serial.write(26);delay(2000);
Serial.println(") Please take an Imediate Action ");delay
(500);
Serial.println
("https://www.google.com/maps/place/");Serial.print
(latitude,6);Serial.print(",");Serial.print
(logitude,6);Serial.write(26);delay(2000);lcd_status();
}
////////////////////////////////////////////////////////////////
//////////////////
void RIGHT()
{
get_gps();show_coordinate();delay(1000);lcd.clear();
Serial.println("ACCIDENT DETECTED ");delay(500);VEHICLE();
}
////////////////////////////////////////////////////////////////
//////////////////
void LEFT()
{
get_gps();show_coordinate();delay(1000);lcd.clear();
Serial.println("ACCIDENT DETECTED ");delay(500);VEHICLE();
}
////////////////////////////////////////////////////////////////
//////////////////
```

```
void LEFT()
{
get_gps();show_coordinate();delay(1000);lcd.clear();
Serial.println("ACCIDENT DETECTED ");delay(500);VEHICLE();
}
////////////////////////////////////////////////////////////////
//////////////////
void STRAIGHT()
{
get_gps();show_coordinate();delay(1000);lcd.clear();
Serial.println("ACCIDENT DETECTED");delay(500);VEHICLE();
}
////////////////////////////////////////////////////////////////
//////////////////
void BACK()
{
```

```
void Send4()
{
init_sms1();BACK();send_sms();delay(1000);lcd_status();
}
////////////////////////////////////////////////////////////////////
////////////////////////////////////////////////////////
void Send5()
{
init_sms1();SOMEBODY();send_sms();delay(1000);lcd_status();
}
////////////////////////////////////////////////////////////////////
////////////////////////////////////////////////////////
void Send6()
{
init_sms1();STOP();send_sms();delay(1000);lcd_status();
}
////////////////////////////////////////////////////////////////////
////////////////////////////////////////////////////////
```

CHAPTER 7

Conclusions and Future Improvements

After implementation, we can observe that this device can perform theft detection, rash driving, tracking and accident detection. There are some limitations in the project which acts as a major hindrance in making the project more robust. The project is designed by using Arduino, GSM and GPS modules. When the latitude and longitude values are collected, these values are given to the Google map so that the location of the vehicle can be tracked successfully. This product provides possibility so that only the authorized user can access the vehicle. After the completion of project it is expected that the rate of stolen vehicle can be reduced through implementation. Another main functionality of this project is to decrease chance of losing life in an accident which we could not stop from occurring. Whenever accident is detected paramedics are called location to save lives.

With the help of image processing technique, we can further improve the module by implementing a Camera and fingerprint sensor. This is another feature which can be installing inside the vehicles. Vehicle can be start by a ignition key as well as fingerprint. Theses improvements can help to resist the unauthorized person by clicking the image of persons and send data to the car owner for more security.

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