GSM AND GPS BASED VEHICLE LOCATION AND TRACKING SYSTEM

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ABSTRACT:

A vehicle tracking system combines the installation of an electronic device in a vehicle, or fleet of vehicles, with purpose-designed computer software to enable the owner or a third party to track the vehicle's location, collecting data in the process. Modern vehicle tracking systems commonly use Global Positioning System (GPS) technology for locating the vehicle, but other types of automatic vehicle location technology can also be used. Vehicle information can be viewed on electronic maps via the Internet or specialized software. In the main they are easy to steal, and the average motorist has very little knowledge of what it is all about. To avoid this kind of steal we are going to implement a system it provides more security to the vehicle. Existing System: In the previous system security lock and alarm is implemented in a car. If a burglar can break open the lock, then it becomes easy for the burglar to steal the car. And in old security system if the car is stolen then it is out of the owner control. User doesn't have any awareness about the current location of the vehicle. The Proposed System: The RF transmitter is attached with the vehicle which has its own identification. This data will be continuously transmitted to the RF receiver connected to the microcontroller. This GPS will be location the position of vehicle and transmit that data to the microcontroller. Suppose the RF receiver not receiving signal from the transmitting unit, receiver unit send the signal to the microcontroller, from that we can identify the theft. If the vehicle is theft it automatically sends location of the vehicle to its owner as a SMS through GSM modem. This will be a much simpler and low cost technique compared to others. If a password like SMS is sent by the owner, it automatically stops the vehicle

Keywords: Global Positioning System (GPS), RF receiver and transmitter, operations and maintenance center (OMC) and Gaussian minimum shift keying (GMSK).

1.INTRODUCTION:

GSM and GPS based vehicle location and tracking system will provide effective, real time vehicle location, mapping and reporting this information value and adds by improving the level of service provided. A GPS-based vehicle tracking system will inform where your vehicle is and where it has been, how long it has been. The system uses geographic position and time information from the Global Positioning Satellites. The system has an "On-Board Module" which resides in the vehicle to be tracked and a "Base Station" that monitors data from the various vehicles. The On-Board module consists of GPs receiver, a GSM modem

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

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

1.2 GSM Overview: Global System for Mobile Communications or GSM (originally from *Groupe Spécial Mobile*), is the world's most popular standard for mobile telephone systems. The GSM Association estimates that 80% of the global mobile market uses the standard.[1] GSM is used by over 1.5 billion people[2] across more than 212 countries and territories.[3] This ubiquity means that subscribers can use their phones throughout the world, enabled by international roaming arrangements between mobile network operators. GSM differs from its predecessor technologies in that both signaling and speech channels are digital, and thus GSM is considered a second generation (2G) mobile phone system. The GSM standard has been an advantage to both consumers, who may benefit from the ability to roam and switch carriers without replacing phones, and also to network operators, who can choose equipment from many GSM equipment vendors.

1.3 GPS Overview: The Global Positioning System (GPS) is a space-based global navigation satellite system (GNSS) that provides reliable location and time information in all weather and at all times and anywhere on or near the Earth when and where there is an unobstructed line of sight to four or more GPS satellites. It is maintained by the United States government and is freely accessible by anyone with a GPS receiver. The GPS project was started in 1973 to overcome the limitations of previous navigation systems, integrating ideas from several predecessors, including a number of classified engineering design studies from the 1960s. GPS was created and realized by the U.S. Department of Defense (USDOD) and was originally run with 24 satellites. It became fully operational in 1994.

2. GSM MODEM:

Fig 1. GSM Modem

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

A GSM modem is a wireless modem that works with a GSM wireless network. A wireless modem behaves like a dial-up modem. The main difference between them is that a dial-up modem sends and receives data through a fixed telephone line while a wireless modem sends and receives data through radio waves. The working of GSM modem is based on commands, the commands always start with AT (which means ATtention) and finish with a <CR> character. For example, the dialing command is ATD<number>; ATD3314629080; here the dialing command ends with semicolon.

The AT commands are given to the GSM modem with the help of PC or controller. The GSM modem is serially interfaced with the controller with the help of MAX 232..

2.1 **Circuit Diagram:**

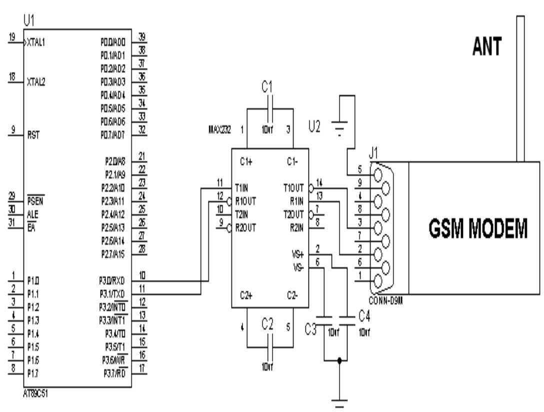

Fig 2. GSM Modem Circuit Diagram

New approaches:

Neither of these approaches proved to be the long-term solution as cellular technology needed to be more efficient. With the experience gained from the NMT system, showing that it was possible to develop a system across national boundaries, and with the political situation in Europe lending itself to international cooperation it was decided to develop a new Pan-European System. Furthermore it was realized that economies of scale would bring significant benefits. This was the beginnings of the GSM system. To achieve the basic definition of a new system a meeting was held in 1982 under the auspices of the Conference of European Posts and Telegraphs (CEPT). They formed a study group called the Groupe Special Mobile (GSM) to study and develop a pan-European public land mobile system. Several basic criteria that the new cellular technology would have to meet were set down for the new GSM system to meet. These included: good subjective speech quality, low terminal and service cost, support for international roaming, ability to support handheld terminals, support for range of new services and facilities, spectral efficiency, and finally ISDN compatibility.

With the levels of under-capacity being projected for the analogue systems, this gave a real sense of urgency to the GSM development. Although decisions about the exact nature of the cellular technology were not taken at an early stage, all parties involved had been working toward a digital system. This decision was finally made in February 1987. This gave a variety of advantages. Greater levels of spectral efficiency could be gained, and in addition to this the use of digital circuitry would allow for higher levels of integration in the circuitry. This in turn would result in cheaper handsets with more features. Nevertheless significant hurdles still needed to be overcome. For example, many of the methods for encoding the speech within a sufficiently narrow bandwidth needed to be developed, and this posed a significant risk to the project. Nevertheless the GSM system had been started.

Global usage: Originally GSM had been planned as a European system. However the first indication that the success of GSM was spreading further a field occurred when the Australian network provider, Telstra signed the GSM Memorandum of Understanding.

Frequencies: Originally it had been intended that GSM would operate on frequencies in the 900 MHz cellular band. In September 1993, the British operator Mercury One-to-One launched a network. Termed DCS 1800 it operated at frequencies in a new 1800 MHz band. By adopting new frequencies new operators and further competition was introduced into the market apart from allowing additional spectrum to be used and further increasing the overall capacity. This trend was followed in many countries, and soon the term DCS 1800 was dropped in favour of calling it GSM as it was purely the same cellular technology but operating on a different frequency band. In view of the higher frequency used the distances the signals travelled was slightly shorter but this was compensated for by additional base stations.

In the USA as well a portion of spectrum at 1900 MHz was allocated for cellular usage in 1994. The licensing body, the FCC, did not legislate which technology should be used, and accordingly this enabled GSM to gain a foothold in the US market. This system was known as PCS 1900 (Personal Communication System)

3.THE GSM NETWORK:

GSM provides recommendations, not requirements. The GSM specifications define the functions and interface requirements in detail but do not address the hardware. The reason for this is to limit the designers as little as possible but still to make it possible for the operators to buy equipment from different suppliers. The GSM network is divided into three major systems: the switching system (SS), the base station system (BSS), and the operation and support system (OSS).

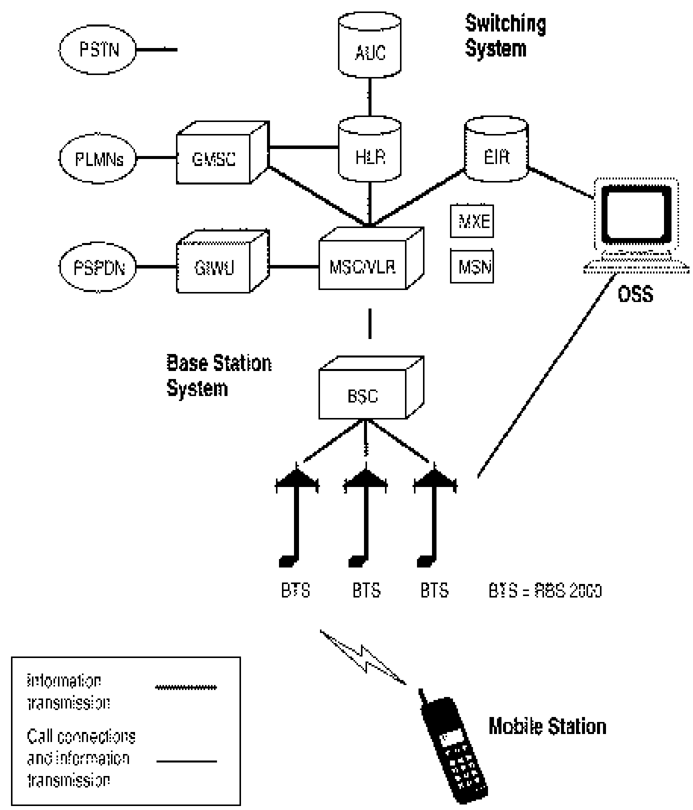

Fig 3.GSM Network Elements

The operations and maintenance center (OMC) is connected to all equipment in the switching system and to the BSC. The implementation of OMC is called the operation and support system (OSS). The OSS is the functional entity from which the network operator monitors and controls the system. The purpose of OSS is to offer the customer cost-effective support for centralized, regional, and local operational and maintenance activities that are required for a GSM network. An important function of OSS is to provide a network overview and support the maintenance activities of different operation and maintenance organizations.

SPECIFICATIONS AND CHARACTERISTICS FOR GSM

The specifications and characteristics for GSM

- frequency band—The frequency range specified for GSM is 1,850 to 1,990 MHz (mobile station to base station).
- duplex distance—The duplex distance is 80 MHz. Duplex distance is the distance between the uplink and downlink frequencies. A channel has two frequencies, 80 MHz apart.
- channel separation—The separation between adjacent carrier frequencies. In GSM, this is 200 kHz.
- modulation—Modulation is the process of sending a signal by changing the characteristics of a carrier frequency. This is done in GSM via Gaussian minimum shift keying (GMSK).
- transmission rate—GSM is a digital system with an over-the-air bit rate of 270 kbps.
-

RESULT

4.1 GSM AND GPS BASED VECHICLE LOCATION AND TRACKING SYSTEM

Description

Present project is designed using 8051 microcontroller in this Project it is proposed to design an embedded system which is used for tracking and positioning of any vehicle by using Global Positioning System (GPS) and Global system for mobile communication (GSM).

In this project AT89S52 microcontroller is used for interfacing to various hardware peripherals. The current design is an embedded application, which will continuously monitor a moving Vehicle and report the status of the Vehicle on demand. For doing so an AT89S52 microcontroller is interfaced serially to a GSM Modem and GPS Receiver. A GSM modem is used to send the position (Latitude and Longitude) of the vehicle from a remote place. The GPS modem will continuously give the data i.e. the latitude and longitude indicating the position of the vehicle. The GPS modem gives many parameters as the output, but only the NMEA data coming out is read and displayed on to the LCD. The same data is sent to the mobile at the other end from where the position of the vehicle is demanded. An EEPROM is used to store the mobile number. The hardware interfaces to microcontroller are LCD display, GSM modem and GPS Receiver. The design uses RS-232 protocol for serial communication between the modems and the microcontroller. A serial driver IC is used for converting TTL voltage levels to RS-232 voltage levels.In the main they are easy to steal, and the average motorist has very little knowledge of what it is all about. To avoid this kind of steal we are going to implement this project which provides more security to the vehicle. When the request by user is sent to the number at the modem, the system automatically sends a return reply to that mobile indicating the position of the vehicle in terms of latitude and longitude from this information we can track our vehicles.

4. APPLICATIONS AND ADVANTAGES

4.1. APPLICATIONS

- Stolen vehicle recovery .
- Field sevice management.
- It is used for food delivery and car rental companies.

4.2 ADVANTAGES:

- It provides more security than other system.
- From the remote place we can access the system.

- By this we can position the vehicle in exact place.

5.CONCLUSION AND FUTURE SCOPE

Vehicle tracking system is becoming increasingly important in large cities and it is more secured than other systems. Now a days vehicle thefting is rapidly increasing , with this we can have a good control in it.The vehicle can be turned off by only with a simple SMS.Since, now a days the cost of the vehicles are increasing they will not step back to offord it.This setup can be made more interactive by adding a display to show some basic information about the vehicle and also add emergency numbers which can be used in case of emergency.Upgrading this setup is very easy which makes it open to future requirements without the need of rebuilding everything from scratch, which also makes it more efficient.

JOURNALS REFFERED:

[1] MarkoWolf, AndreWeimerskirch, and ThomasWollinger, “State of the Art: Embedding security in vehicles”, Journal on Embedded Systems, Volume 2007, Article ID 74706.

[2] J.-P. Hubaux, S. C Apkun, and J. Luo, “The security and privacy of smart vehicles,” *IEEE Security & Privacy Magazine*, vol. 2, no. 3, pp. 49–55, 2004.

[3] Alison Brown, JacobGriesbach and Bruce Bockius, “GPS traking location based service using wrist watch GeoZigBee Sensors”, Proceddings of ION NTM, 2007, Som Diego, pp 1-10, December 2007.

[4] W.Stallings, “Cryptography and Network Security”, Prentice-Hall, Englewood Cliffs, NJ, USA, 4th edition, 2005.

[5] Ingrid Verbourwhede, Frank Hoornaert, Joos Vandewalle, Hugo J. Deman “Security and performance optimization of a new DES”, IEEE Journal on Solid State ciruits, vol. 23, no.3, pp 647-656, 1999.

[6] National Institute of Standards & Technology, “FIPS-46-3: Data Encryption Standard (DES),” October 1977, reaffirmed in October 1999.

[7] Sinpyo Hong, Man Hyung Lee, Sun Hong Kwon, and Ho Hwan Chun, “A Car test for the estimation of GPS/INS alignment errors”, IEEE TRANSACTIONS ON INTELLIGENT TRANSPORTATION SYSTEMS, VOL. 5, NO. 3, pp 208-218, SEPTEMBER 2004.

[8] Youjing Cui and Shuzhi Sam Ge,”Autonomous vehicle positioning with GPS in urban canyon environments”, IEEE TRANSACTIONS ON ROBOTICS AND AUTOMATION, vol. 19, NO. 1, pp 15-25, February 2003.

BOOKS REFFERED

- Adler, R. B., A. C. Smith, and R. L. Longani: “*Introduction to Semiconductor Physics*,” vol. 1, p. 78, Semiconductor Electronics Education Comitee, John Wiley & Sons, *Inc.*, New York ,1964.
- Jacob Millman Christos C. Halkias.: “*Electronic Devices And Circuits*”, Tata McGraw-Hill Publishing Company Ltd. Sep, 2003.
- Schade, O. H.: “*Analysis of Rectifier Operation*”, proc. *IRE*, vol.31, pp. 341-361, July, 1943.
- Stout, M. B.: “*Analysis of Rectifier Circuits”*, *Elec. Eng.*, vol. 54, September, 1935.
- The 8051 Microcontroller and Embedded Systems using Assembly and C by Muhammad Ali Mazidi, Janice Gillispie, Rolin D.Mckinlay.
- Wireless communication and netwoking – JonW.Mark and Weihua Zhqung,PHI,2005.
- "Power Electronics” by M D Singh and K B Khanchandan
- "Linear Integrated Circuits” by D Roy Choudary & Shail Jain

WEBSITES:

- http://en.wikipedia.org/wiki/Seven-segment_display
- http://www.gsm-modem.de/
- http://www.datasheetsite.com/datasheet/MAX232
- http://www.rentron.com/rf_remote_control.htm
- http://www.atmel.com/dyn/resources/prod_documents/doc0401.pdf

APPENDIX: SOURCE CODE

MAIN SOURCE CODE

```
#include <REGX51.H>
#include"SERIAL.c"
#include"LCD.c"
sbit rf=P2^0;
sbit relay=P0^1;
sbit motor=P0^0;
unsigned char asc,ok[2],r[4],a,n[15],e[15],i,oxoa,
a,m[20],j,temp[10],temp1[10];
void cmdwrt_lcd(unsigned char cmd);
void serial_transmit(unsigned char *srstr);
void command(unsigned char d[]);
void serial_tx(unsigned char srda);
```

```
void delay1();
void gps()
        {
        do
                {
                do
                        {
                        oxoa = serial_rx();
                        }while(oxoa != 0x0A);
                for(i=0;i<4;i++)
                        {
                        r[i] = serial_rx();
                        }
                }while(r[3] != 'R');
        do
                {
                a = serial_rx();
                }while(a != 'A');
        serial_rx();
        i = 0;
        do
                {
                n[i] =serial_rx();
                i++;
                }while(n[i-1] != 'N');
        n[i] = '\0';
  serial_rx();
        i = 0;
        do
                {
                e[i] = serial_rx();
                i++;
                }while(e[i-1] != 'E');
        e[i] = '\0';
        i=0;
        TI=0;
        cmdwrt_lcd(0x01);
        cmdwrt_lcd(0x80);
        serial_transmit("latitude value:");
        serial_transmit(&n[0]);
        display_lcd(&n[0]);
        serial_tx(',');
        serial_tx(0x0a);
        cmdwrt_lcd(0xC0);
        serial_transmit("longitude value:");
        serial_transmit(&e[0]);
        display_lcd(&e[0]);
        }


void gsm_send()
        {
                command("AT");
                delay1();
                command("AT+CMGF=1");
                delay(65000);
                delay(65000);
                //display_lcd("AT+CMGS=");
                serial_transmit("AT+CMGS=");
                serial_tx("");
                cmdwrt_lcd(0xC0);
                //display_lcd("9940645764");
                serial_transmit("9710362655");
                serial_tx("");
                serial_tx(0x0d);
                serial_tx(0x0a);
                delay(65000);
                delay(65000);
                //display_lcd("Vehicle Thefted ");
                delay(65000);
                delay(65000);
                delay(65000);
                serial_transmit("Vehicle Thefted
                ");
                serial_tx(0x0a);
                serial_transmit("Current Location:
                ");
                cmdwrt_lcd(0x01);
                gps();
                serial_tx(0x0a);
                delay(650);
                serial_tx(0x1A);
                delay(65000);
                delay(65000);
                delay(65000);
                delay(65000);
                delay(65000);
                delay(65000);
        /*ommand("AT");
                delay1();
                command("AT+CMGF=1");
                delay(65000);
                delay(65000);
                //display_lcd("AT+CMGS=");
                serial_transmit("AT+CMGS=");
                serial_tx("");
                cmdwrt_lcd(0xC0);
                //display_lcd("9940645764");
                serial_transmit("9710362655");
                serial_tx("");
                serial_tx(0x0d);
                serial_tx(0x0a);
                delay(65000);
                delay(65000);
                //display_lcd("Vehicle Thefted ");
                delay(65000);
                delay(65000);
                delay(65000);
                serial_transmit("Vehicle Thefted
                ");
                serial_tx(0x0a);
                serial_transmit("Current Location:
                ");
                cmdwrt_lcd(0x01);
                gps();
                serial_tx(0x0a);
                delay(650);
                serial_tx(0x1A);
                delay(65000);
                delay(65000);
                delay(65000);
```

```
                delay(65000);
                delay(65000);
                delay(65000);
                //cmdwrt_lcd(0x01);          */
        }
void gsm_send1()
        {
                command("AT");
                delay1();
                command("AT+CMGF=1");
                delay(65000);
                delay(65000);
                //display_lcd("AT+CMGS=");
                serial_transmit("AT+CMGS=");
                serial_tx('"');
                cmdwrt_lcd(0xC0);
                //display_lcd("9940645764");
                serial_transmit("9710362655");
                serial_tx('"');
                serial_tx(0x0d);
                serial_tx(0x0a);
                delay(65000);
                delay(65000);
                //display_lcd("Vehicle Thefted ");
                delay(65000);
                delay(65000);
                delay(65000);
                serial_transmit(" Your vehicle
Stopped at ");
                serial_tx(0x0a);
                serial_transmit("Current Location:
");
                cmdwrt_lcd(0x01);
                gps();
                serial_tx(0x0a);
                delay(650);
                serial_tx(0x1A);
                delay(65000);
                delay(65000);
                delay(65000);
                delay(65000);
                delay(65000);
                delay(65000);
        /*ommand("AT");
                delay1();
                command("AT+CMGF=1");
                delay(65000);
                delay(65000);
                //display_lcd("AT+CMGS=");
                serial_transmit("AT+CMGS=");
                serial_tx('"');
                cmdwrt_lcd(0xC0);
                //display_lcd("9940645764");
                serial_transmit("9710362655");
                serial_tx('"');
                serial_tx(0x0d);
                serial_tx(0x0a);
                delay(65000);
                delay(65000);
                //display_lcd("Vehicle Thefted ");
                delay(65000);
                delay(65000);
                delay(65000);
                serial_transmit(" Your vehicle
Stopped at ");
                serial_tx(0x0a);
                serial_transmit("Current Location:
");
                cmdwrt_lcd(0x01);
                gps();
                serial_tx(0x0a);
                delay(650);
                serial_tx(0x1A);
                delay(65000);
                delay(65000);
                delay(65000);
                delay(65000);
                delay(65000);
                delay(65000);        */
        }

void wait_0x0a()
        {
                do
                        {
                        a=serial_rx();
                        }while(a!=0x0a);
        }
void rec_msg()
        {
                                        //receving
message//
        unsigned char i=0;
                do

                  {
                        while(RI==0);
                        temp[i]=SBUF;
                        i++;
                        RI=0;
                        } while(temp[i-
1]!=0x0A);
                        }
void check_ok()
{
 unsigned char i;
        for(i=0;i<=3;i++)
                                //receving OK//
                {
                        while(RI==0);
                        temp1[i]=SBUF;
                        RI=0;
                }
}
void command(unsigned char d[])
        {
                serial_transmit(&d[0]);
                cmdwrt_lcd(0x80);
                //display_lcd(&d[0]);
                serial_tx(0x0d);
                wait_0x0a();
                check_ok();
```

```
			temp1[2]='\0';
			delay(65000);
			delay(65000);
			cmdwrt_lcd(0xc0);
		//display_lcd(&temp1[0]);
		}
void delay1()
		{

		delay(65000);delay(65000);delay(65000);
		}
void gsm_read()
		{
			command("AT");
			delay1();
			command("AT+CMGF=1");
			delay1();
			command("AT+CGSMS=1");
			delay1();
			command("AT+CMGD=1");
			delay1();
			cmdwrt_lcd(0x01);
			cmdwrt_lcd(0x80);
			display_lcd("Waiting for Msg");
			for(j=0;j<=15;j++)
				{
					while(RI==0);
						//
receving message no//
					m[j]=SBUF;
					RI=0;
				}
			delay1();
			cmdwrt_lcd(0xC0);
			display_lcd(&m[0]);
			delay1();
			cmdwrt_lcd(0x01);
			cmdwrt_lcd(0x80);
			serial_transmit("AT+CMGR=1");
			display_lcd("AT+CMGR=1");
			serial_tx(0x0d);
			wait_0x0a();
			wait_0x0a();
			wait_0x0a();
			rec_msg();
			delay1();
			temp[4]='\0';
			cmdwrt_lcd(0xc0);
			display_lcd(&temp[0]);
			delay1();
			delay1();
			if(temp[0]=='S'&&
temp[1]=='t'&&temp[2]=='o'&&temp[3]=='p')
				{
					motor=0;

		cmdwrt_lcd(0x01);

		cmdwrt_lcd(0x80);

		display_lcd("Vehicle Stopped");
					relay=0;
					gsm_send1();

		cmdwrt_lcd(0x01);

		cmdwrt_lcd(0x80);

		display_lcd("Vehicle Stopped");

				}

		}
void main()
		{
			serial_init();
			lcd_init();
			P0=0x00;
			display_lcd("GSM & GPS
BASED ");
			cmdwrt_lcd(0xC0);
			display_lcd("VEHICLE
TRACKING");
			motor=1;
			delay(65000);
			delay(65000);
			delay(65000);
			delay(65000);
			while(1)
			{
				if(rf==0)
				{

		cmdwrt_lcd(0x01);
				display_lcd("
VEHICLE THEFTED");
				gsm_send();
				relay=1;
				gsm_read();
				while(rf==0);
				}
			}
		}
```

LCD CODE

```
 sbit rs = P3^5;

sbit rw = P3^6;

sbit en = P3^7;

void delay(unsigned int dela)
  {
  unsigned int i;
  for(i=0;i<dela;i++);
  }

void cmdwrt_lcd(unsigned char cmd)
		{
		P1 = cmd;
		rs = 0;
```

```
        rw = 0;
        en = 1;
        delay(15);
        en = 0;
        delay(150);
        }

void datawrt_lcd(unsigned char datas)
        {
        P1 = datas;
        rs = 1;
        rw = 0;
        en = 1;
        delay(15);
        en = 0;
        delay(150);
        }

void display_lcd(unsigned char *lcdstr)
        {
        while (*lcdstr !='\0')
                {
                datawrt_lcd(*lcdstr);
                lcdstr++;
                }
        }

void lcd_init()
        {
        cmdwrt_lcd(0x38);
        cmdwrt_lcd(0x0C);
        cmdwrt_lcd(0x01);
                cmdwrt_lcd(0x80);
        }
```