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GPS BASED AUTOMATIC VEHICLE MONITORING SYSTEM

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Abstract- In recent years, a lot of research has been done in the area of automated vehicles and automatic highway systems (AHS) and many others. A vehicle monitoring 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.

Vehicle tracking systems are available vastly in market, but a good and effective product tends to be of more cost. This paper is proposed to design and develop a tracking system that is much cost effective than the systems available in the market.

The objects of the paper are: designing of aremote control vehicle having the facility of tracking locationthrough GPS tracking & detection of object to avoid collision.

Keywords: Location Based Services, GPS, RF receiver and transmitter, Vehicle tracking system (VTS).

1. INTRODUCTION

GPS based vehicle location and monitoring system will provide effective, real time vehicle location, mapping and reporting this information 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 vehicles. The On-Board module consists ofGPS receiver. In general, we have no correct mechanism toknow the parameters like the route in which a vehicle has travelled, where was it at a particular instant of time, with what speed did it travel at that place and time and did it go to the desired place or not, we don't have a option rather than to believe the driver. The problem arises when the driver doesn't give us the exact authentic information. If we want vehicle to go to certain place, via certain route later when we access the information about the journey, we have to simply depend up on the driver for the information of the vehicle and the driver may not give us the exact information about the journey and could use the (vehicle) for his personal use. The GPS BASED VEHICLE MONITORING SYSTEM answers to all the problems arose above. We can know the parameters like latitude and longitude; route adopted by the driver without being dependent on him. We make use of a GPS modem, Micro controller and a wireless network (RF transceiver) and PC. Data from GPS receiver is sent to the LCD. We can store the position of vehicle by using remote control. Later this stored information can be viewed by connecting it to PC.

The paper is divided into the following sections. Section 1 introduces the model and concept of the GPS based Vehicle tracking system (VTS). Section 2provides the methods and technologies used in these systems. Section 3 describes the technology adopted for the system to make it efficient in various aspects. Section 4provides the testing information and the implementation of the system. Section 5 gives the conclusion.

2. PRINCIPLE OF OPERATION

The vehicle monitoring system deals with the latitude and longitude of vehicle which is obtained from GPS receiver and display the data on the LCD.As it involves the identification of the vehicle it requires a Global Processing System (GPS) to know the position of the vehicle. There are 24 satellites revolving around the earth's orbit, at least 3 satellites are required for the GPS receiver. When the GPS receiver is exposed to at least 3 satellites it receives the data from the satellites i.e. latitude, longitude, distance, speed, time, altitude. The receiver continuously gives the data until it is switched off. A 5V external power supply is given to the GPS receiver. The baud rate of the GPS receiver is 4800 bits/sec.

The GPS receiver is interfaced with a Microcontroller (AT 89C51). The 5V power supply is needed for the micro controller. The GPS receiver is interfaced with the Microcontroller using a RS-232 protocol. The data from the GPS RECEIVER is transferred to the PC using a wireless network i.e. RF transceiver. There are two RF transceivers, one is connected to PC and other is connected to Microcontroller. The data is presented in the Google Earth map graphically. For collision avoidance it uses IR sensor to sense the obstacle and send signal to embedded controller. The embedded controller receives these obstacle detecting signals and then send signal to motors for taking direction to avoid obstacle. The project uses µc 80C51 as the controlling element. It uses 3 IR (Infra Red) sensors and 3 IR transmitting circuitry. When the obstacle comes in path of robot IR beam is reflected from the obstacle then sensor gives +5V voltage to µc. This +5V voltage is detected then µc decides to avoid the obstacle by taking left or right turn. If the sensor gives zero to µc that means there is no obstacle present in its path so it goes straight until any obstacle is detected. The three IR transmitter circuits are fitted on front, right and left side of robot. The three IR sensors are placed near to transmitters' IR LEDs. The connections can be given from main circuit to sensors using simple twisted pair cables. Two motors namely right motor and left motor are connected to driver IC (L293D). L293D is interface with µc. Micro-controller sends logic 0 & logic 1 as per the programming to driver IC which moves motors forward or reverse direction.

3. BLOCK DIAGRAM

3.1 GPS Section

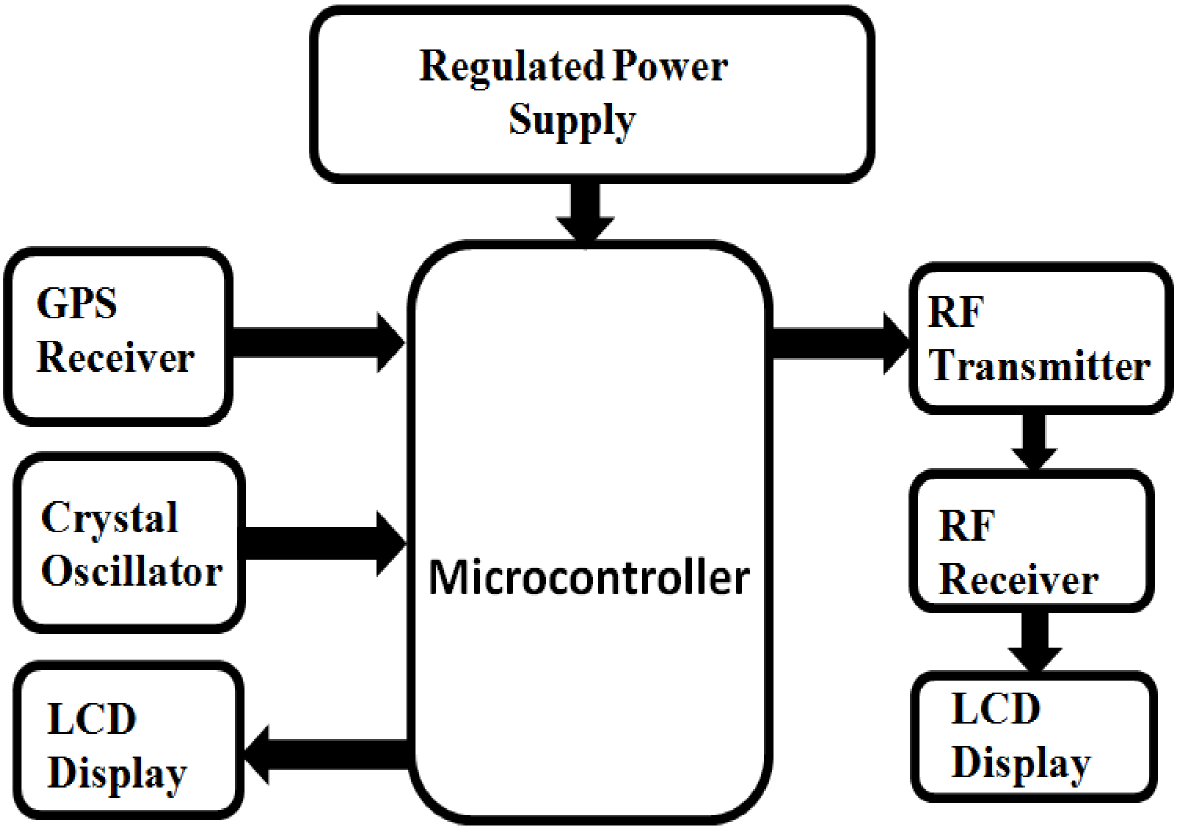

Fig. 3.1G.P.S Based Vehicle Monitoring System

3.2 Collision Avoidance Section

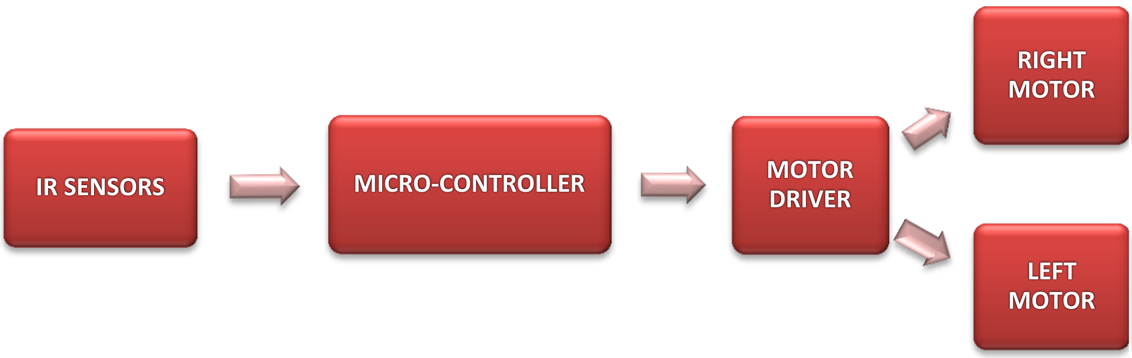

Fig 3.2 Collision Avoidance System

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4. CIRCUIT DIAGRAM

4.1 Interfacing with Microcontroller

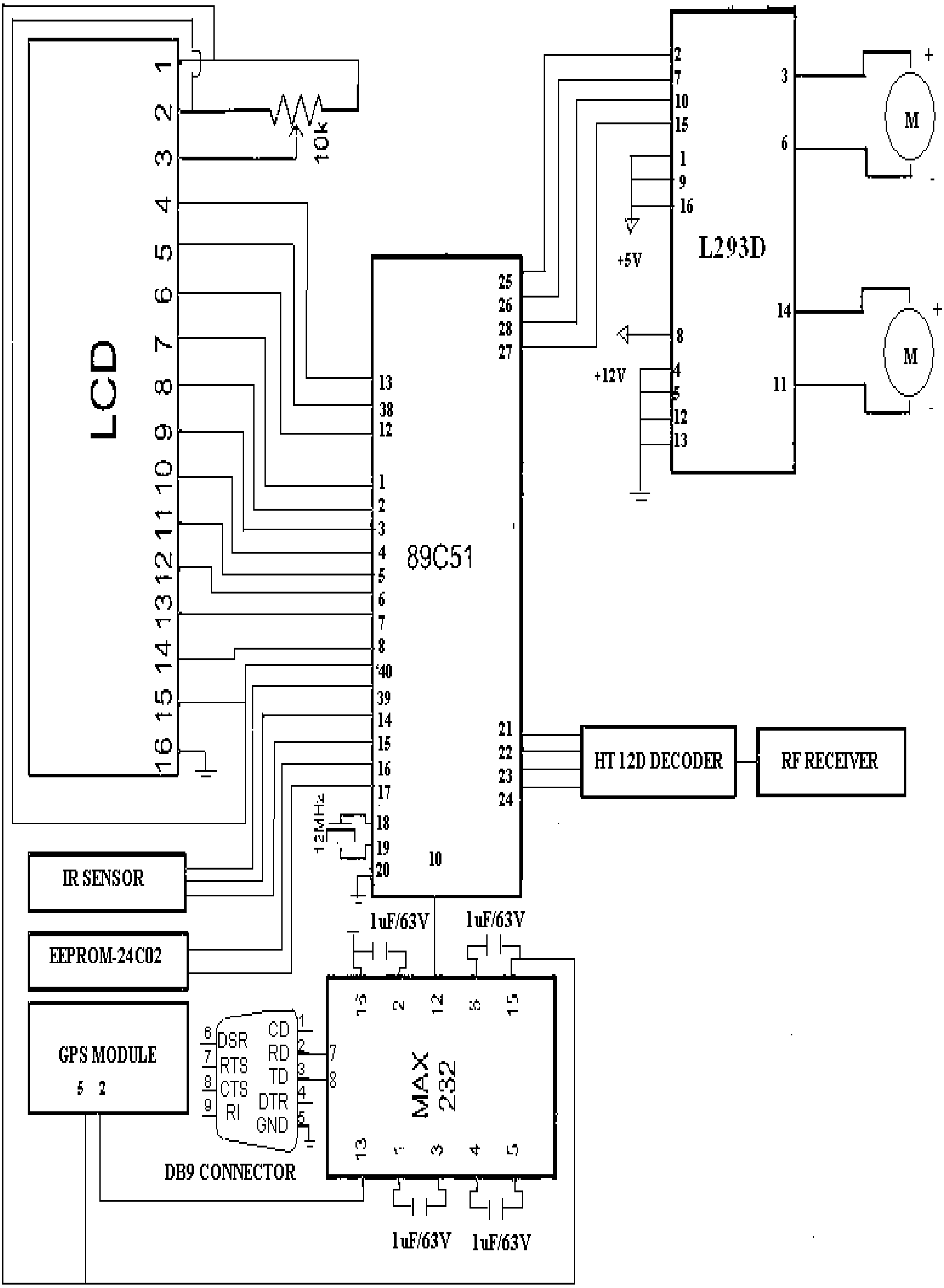

Fig 4.1 Interfacing With 89C51

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4.2 Collision Avoidance Section

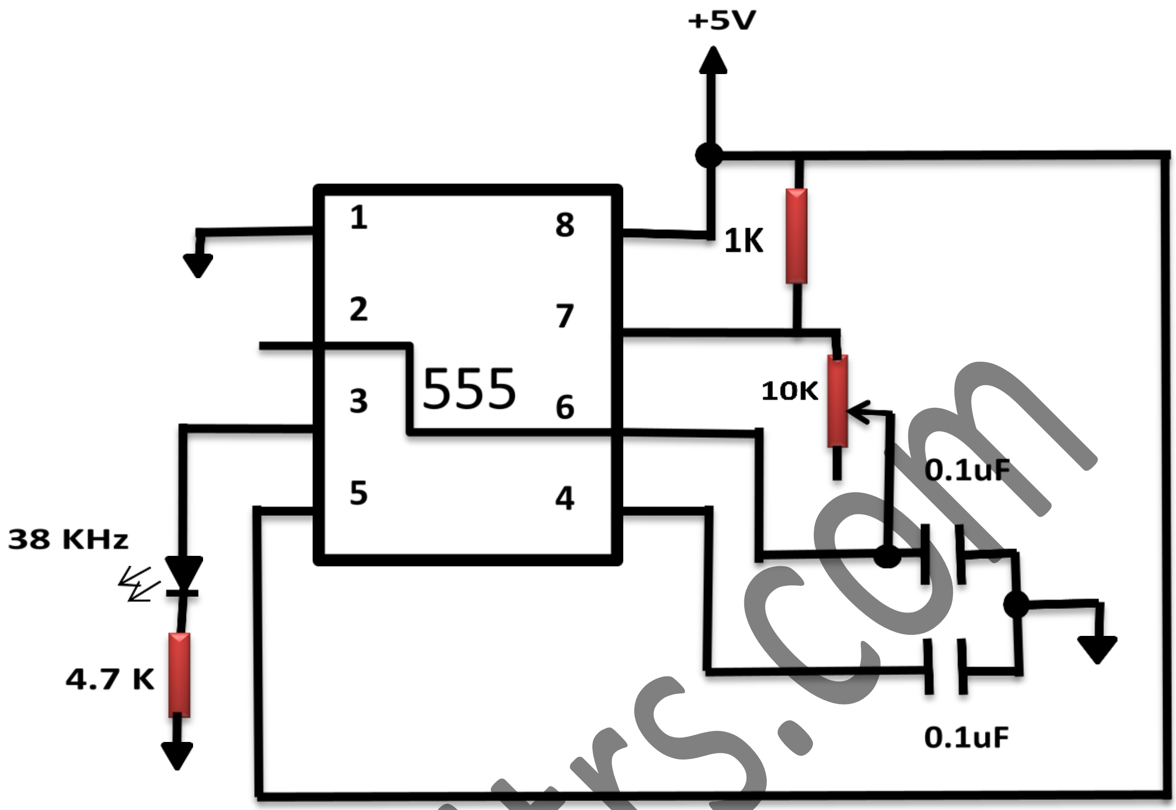

Fig. 4.2 Transmitter Circuit

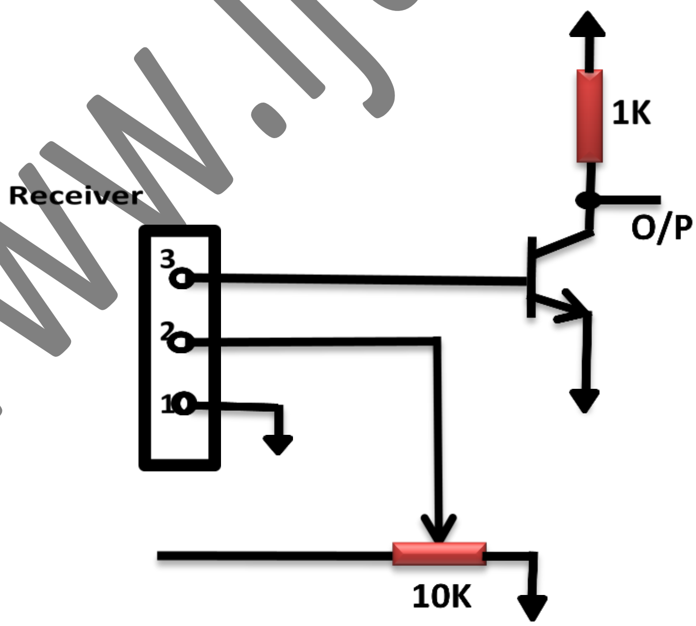

Fig. 4.3 Receiver Circuit

5. GPS Technology

The Global Positioning System (GPS) is a satellite-based navigation system consists of a network of 24 satellites located into orbit. The system provides essential information to military, civil and commercial users around the world and which is freely accessible to anyone with a GPS receiver. GPS works in any weather circumstances at anywhere in the world. Normally no subscription fees or system charges to utilize GPS. A GPS receiver must be locked on to the signal of at least three satellites to estimate 2D position (latitude and longitude) and track movement. With four or more satellites in sight, the receiver can determine the user's 3D position (latitude, longitude and altitude). Once the vehicle position has been determined, the GPS unit can determine other information like, speed, distance to destination, time and other. GPS receiver is used for this research work to detect the vehicle location and provide information to responsible person.

5.1 Features of GPS Module

- Low cost
- Compact (25. 4 x 25. 4 x 7 mm)
- 32 Channel Receiver
- Low Power Consumption
- Built-in Antenna
- Standard NMEA protocol: USB or Serial
- Available baud rate :4800/9600/14400/19200/38400/57600/115200
- Frequency: 1575. 42 MHz
- Power Supply : 3. 3 ~ $5V_{dc}$
- Maximum Altitude :18,000 meter
- Maximum Velocity :515 meter/second

Fig. 5.1GPS Modem Device (MR-87)

6. IMPLEMENTATION, DEBUGGING AND TESTING PROCESS

A microcontroller-based system is a complex activity that involves hardware and software interfacing with the external world. Doing well design of a microcontroller-based system requires skills to use the variety of debugging and testing tools available. The debugging and testing of microcontroller-based systems divided into two groups: software-only tools and software-hardware tools.
The software program has written in C or assembly language and compiled using µVision Keil software. After compiler operation, the hex code generated and stored in the computer.

6.1 Programming

6.1.1 GPS Section

```
* Basic program to show latitude and longitude on LCD extracted from GPGGA statement */
#include<reg51.h>
#define port2 P2
sbitrs = P1^0;
sbitrw = P1^1;
sbit e = P1^2;
char info[70];
char test[6]={"$GPGGA"};
charcomma_position[15];
unsignedint check=0,i;
unsigned char a;
voidreceive_data();
```

```
voidlcd_latitude();
voidlcd_longitude();

//DELAY FUNCTION

void delay(unsigned intmsec)
{
        inti,j
        for(i=0;i<msec;i++)
        for(j=0;j<1275;j++);
}

// LCD COMMAND SENDING FUNCTION

voidlcd_cmd(unsigned char item)
{
        port2 = item;
        rs= 0;
        rw=0;
        e=1;
        delay(1);
        e=0;
        return;
}
// LCD DATA SENDING FUNCTION
voidlcd_data(unsigned char item)
{
        port2 = item;
        rs= 1;
rw=0;
        e=1;
        delay(1);
        e=0;
        return;
}
 // LCD STRING SENDING FUNCTION
voidlcd_string(unsigned char *str)

{
        int i=0;
        while(str[i]!='\0')
        {
    lcd_data(str[i]);
    i++;
    delay (10);
    }
    return;
}

// SERIAL PORT SETTING
void serial()
{
        TMOD=0x20;    //MODE=2
        TH1=0xfa;          // 4800 BAUD
        SCON=0x50  ;   // SERIAL MODE 1 ,8- BIT DATA ,1 STOP BIT ,1 START BIT , RECEIVING ON
        TR1=1;        //TIMER START
}
voidfind_comma()

{
        unsignedinti,count=0;
```

```
        for(i=0;i<70;i++)
        {
                if(info[i]==',')
                {
                        comma_position[count++]=i;
                }
        }
}
void compare()
{
        IE=0x00;                //Interrupt disable
        find_comma();           //Function to detect position of comma in the string
        lcd_latitude();         //Function to show Latitude
        lcd_longitude();        //Function to show Longitude
        check=0;
        IE=0x90;                //Interrupt enable
}
voidreceive_data()                      interrupt 4
{
        info[check++]=SBUF;     //Read SBUF

        if(check<7)             //Condition to check the required data
        {
                if(info[check-1]!=test[check-1])
                check=0;
        }
        RI=0;
}
voidlcd_shape()        //Function to create shape of degree
{
        lcd_cmd(64);
        lcd_data(10);
        lcd_data(17);
        lcd_data(17);
        lcd_data(10);
        lcd_data(0);
        lcd_data(0);
        lcd_data(0);
        lcd_data(0);
}
voidlcd_latitude()              //Function to display Latitude
{
        unsignedint c2=comma_position[1]; //Position of second comma
        lcd_shape();
        lcd_cmd(0x01);          // Clear LCD display
        lcd_cmd(0x84);          //Move cursor to position 6 of line 1
        lcd_string("LATITUDE"); //Showing Latitude
        lcd_cmd(0xC0);                          //Beginning of second line
        lcd_data(info[c2+1]);
        lcd_data(info[c2+2]);
        lcd_data(0);                            //Degree symbol
        lcd_data(info[c2+3]);
        lcd_data(info[c2+4]);
        lcd_data(info[c2+5]);
        lcd_data(info[c2+6]);
        lcd_data(info[c2+7]);
        lcd_data(info[c2+8]);
        lcd_data(info[c2+9]);
        lcd_data(0x27);         //ASCII of minute sign(')
        lcd_data(info[c2+10]);
        lcd_data(info[c2+11]);
```

```
        delay(250);
}
voidlcd_longitude()
{
        unsignedint c4=comma_position[3];
        lcd_cmd(0x01);          //Clear LCD display
        lcd_cmd(0x84);          //Move cursor to position 4 of line 1
        lcd_string("LONGITUDE");                //Showing Longitude
        lcd_cmd(0xC0);                  //Begining of second line
        lcd_data(info[c4+1]);
        lcd_data(info[c4+2]);
        lcd_data(info[c4+3]);
        lcd_data(0);
        lcd_data(info[c4+4]);
        lcd_data(info[c4+5]);
        lcd_data(info[c4+6]);
        lcd_data(info[c4+7]);
        lcd_data(info[c4+8]);
        lcd_data(info[c4+9]);
        lcd_data(info[c4+10]);
        lcd_data(0x27);         //ASCII of minute sign(')
        lcd_data(info[c4+11]);
        lcd_data(info[c4+12]);
        delay(250);
}
void main()
{
        serial();
        lcd_cmd(0x38);          //2 LINE, 5X7 MATRIX
        lcd_cmd(0x0e);          //DISPLAY ON, CURSOR BLINKING
        IE=0x90;
        while(1)
        {
                if(check==69)
                compare();
        }
}
```

6.2 Collision Avoidance Section

6.2.1 Algorithm

Step 1: Start
Step 2: Initialize the input port & output port.
Step 3: Read data from pin 2.0,pin 2.1,pin 2.2.
Step 4: If pin2.0=1, turn right.
    Else goto step 5.
Step 5: If pin2.1=1, turn right.
    Else goto step 6.
Step 6: If pin2.2=1, turn left.
    Else goto step 7.
Step 7: If pin2.0&pin2.1=1, turn right
    Else goto step 8.
Step 8: If pin2.2&pin2.1=1, turn left
    Else goto step 9.
Step 9: If pin2.0&pin2.2=1,move forward
    Else goto step 10.
Step 10: If pin2.0&pin2.1&pin2.2=1, move backward
    Else goto step 11.
Step 11: Again go to step 3.
Step 12: Stop.

6.2.2 Programming

```
#$mod51
org 00h
mov p2,#0ffh
ag: mov a,p2
        anl a,#07h
        cjne a,#01h,la1
        mov p1,#02h
        sjmpag
la1:
        mov a,p2
        anl a,#07h
        cjne a,#02h,la2
        mov p1,#02h
        sjmpag
la2:
        mov a,p2
        anl a,#07h
        cjne a,#04h,la3
        mov p1,#02h
        sjmpag
la3:
        mov a,p2
        anl a,#07h
        cjne a,#00h,la4
        mov p1,#00010100b
        sjmpag
la4:
        mov a,p2
        anl a,#07h
        cjne a,#07h,la5
        mov p1,#0ah
        sjmpag
la5:
mov a,p2
anl a,#07h
cjne a,#03h,la6
mov p1,#00001100b
sjmpag
la6:
mov a,p2
        anl a,#07h
        cjne a,#06h,ag
        mov p1,#00010010b
        sjmpag
end
```

6.3 Hardware Assembling and Testing

First step, we need to make single side PCB layout for the given circuit diagram. After made the PCB the following process is required to complete the project.

- Assemble all the components on the PCB based on circuit diagram.
- Connect the GPS module according to circuit diagram.
- This projects implemented and tested successfully by us.
- This system is very useful and secure for car owners.

CONCLUSION

In this paper, we have proposed a novel method of vehicle tracking systems used to track the vehicle by using GPS technology. The proposed system operated efficiently and was cost effective. It is beneficial to vehicles that follow a specific travelling route on a daily basis. Also further enhancements like breakdown alert and over speeding alert can be made in to the system. It can also be beneficial for:

- To track animals in jungles
- Delivery services
- Cops department and fire services

This project can be further enhanced by the use of camera and by developing a mobile based application to get the real time view of the vehicle instead to check it on PC, which would be more convenient for the user to track the target.

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