



GSM(sms) Controlled Robot

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Abstract— Now days the usage of mobile phone is enormous, cell phone is not only a device to communicate with humans. It is very much useful to communicate and command the machine also. This project is one among them.

The objective of this project is to control and operate the robot with help of cell phone through short messaging service (SMS) technique. But here we are using the GSM modem instead of using cell phone.

This project is designed with robot assembly, micro controller, and GSM modem, data cable, and level converter, relay circuit, relay and dc motors. The micro controller is flash type memory reprogrammable micro controller.

Keywords- AT89s51 microcontroller chip, Motor driver, User, controlling robot at sms command

I. INTRODUCTION

GSM controlled robot or SMS controlled robot is a wireless robot which performs the necessary actions by receiving a set of instructions in the form a Short Message Service (SMS). In this project we can control the robot directions like forward, backward, left and right by sending SMS from the mobile. Earlier, we have already seen the [working of a DTMF Controlled Robot](#) without using Microcontroller.

This project mainly consists of 2 sections, one is mobile unit and the other one is robot unit. The GSM modem which is fixed at the robot receives the messages sent by the mobile and gives the instructions to the microcontroller to control the robot directions. In this project, we interface [8051 microcontroller](#) with GSM SIM 300. The protocol used for the communication between controller and GSM modem is UART (Universal Asynchronous Receiver-Transmitter). This system continuously checks for message to take the decision for controlling the robot.

II. METHODOLOGY

In this project GSM MODEM is connected to micro controller through data cable and level converter. Data cable is the cable which is used to communicate between cellular phone and microcontroller. By using data cable we can send and receive commands to cell phone and from cell phone. Level converter is nothing but RS232 the output of the cell phone signals given to level converter in which the signals are converted into 0 and 5v pulse then these signals are given to the micro controller.

In micro controller we have to program to get the input signal from the cell phone through the data cable and the micro controller will activate the relay through the relay driver circuit which contains transistors, which acts as the switch. So it can control the relay. The relay outputs are connected to DC Motors and the dc motors will drive the robot according to the command received.

For an example, if you want to drive the robot to forward direction you have to send SMS to the modem to which is connected to robot. After receiving the SMS the modem send the corresponding signals to micro controller through the data cable and level converter, now the micro controller activates the corresponding relay, so DC motor will be operated robot moving in the forward direction. Similarly we can drive the robot to reverse direction left side and right side as well.

By using this project we can control the robot through the mobile phone. The special feature of this robot is it is fully operated with the help of battery.

Hardware Requirement

- 8051 Microcontroller
- AT89s51 Programming board
- Programming cable
- 16*2 LCD
- MAX 232 level converter
- GSM sim 300 module
- L293D motor driver
- Robot
- 9V DC batteries – 2
- 5V power supply circuit
- 0.1uF ceramic capacitors – 4

- 33pF capacitors – 2
- 10uF electrolytic capacitor
- 12MHz crystal
- 10k (1/4 watt) resistor
- Single pin connecting wires

8051 Microcontroller

8051 microcontroller is designed by Intel in 1981. It is an 8-bit microcontroller. It is built with 40 pins DIP (dual inline package), 4kb of ROM storage and 128 bytes of RAM storage, 2 16-bit timers. It consists of are four parallel 8-bit ports, which are programmable as well as addressable as per the requirement. An on-chip crystal oscillator is integrated in the microcontroller having crystal frequency of 12 MHz Which is shown in fig 1.0.



Figure 1.0

AT89s51 Programming board and Programming cable

The Atmel AT89S51 is an 8051 based Full Static CMOS controller with Three-Level Program Memory Lock, 32 I/O lines, 2 Timers/Counters, 6 Interrupts Sources, Watchdog Timer, 2 DPTRs 4K Flash, 128 Bytes On-chip RAM. Which is shown in fig 1.2

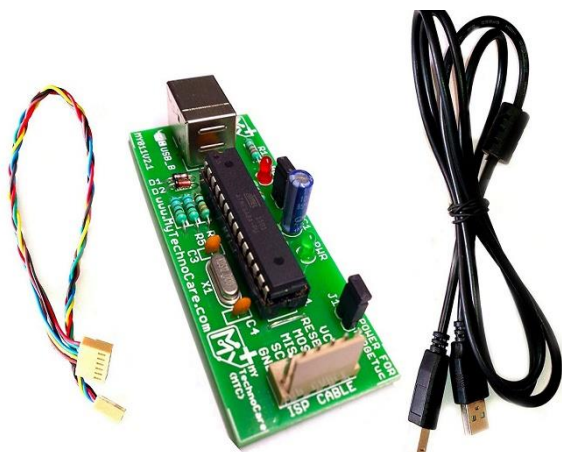


Figure 1.1

16*2 LCD

An electronic device that is used to display data and the message is known as LCD 16x2. As the name suggests, it includes 16 Columns & 2 Rows so it can display 32 characters (16x2=32) in total & every character will be made with 5x8 (40) Pixel Dots. Which is shown in fig 1.2.

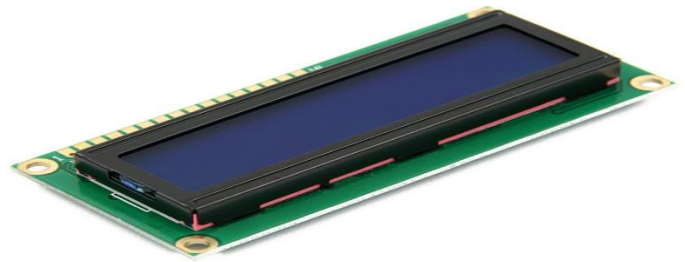


Figure 1.2

MAX 232 level converter

The MAX232 is an integrated circuit by Maxim Integrated Products that converts signals from a TIA-232 (RS-232) serial port to signals suitable for use in TTL-compatible digital logic circuits. The MAX232 is a dual transmitter / dual receiver that typically is used to convert the RX, TX, CTS, RTS signals.



Figure 1.3

GSM sim 300 module

SIM 300 is a GSM modem with a simple serial interface. SIM 300 modem can accept any GSM network operator SIM card and act just like a mobile phone with its own unique phone number. With this module one can send/receive SMS, connect to internet via GPRS and receive calls



Figure 1.4

L293D motor driver

L293D IC is a typical Motor Driver IC which allows the DC motor to drive on any direction. This IC consists of 16-pins which are used to control a set of two DC motors instantaneously in any direction.

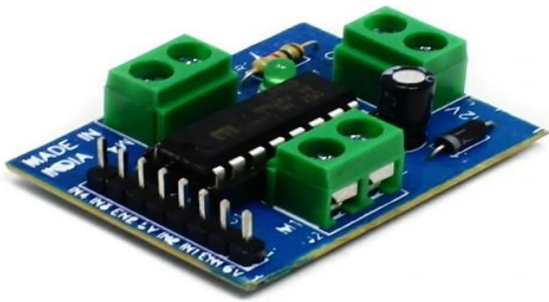


Figure 1.6

Robot body part



Figure 1.7

Circuit diagram

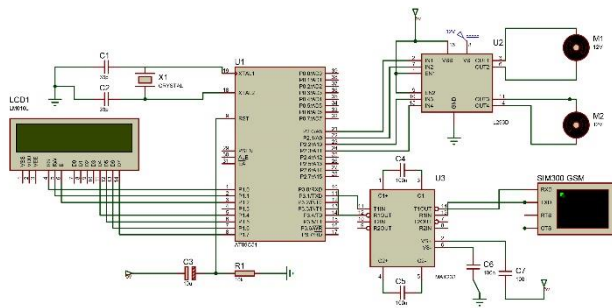


Figure 1.7

Circuit Principle:

When we send the message from the mobile to the modem, GSM modem sends the below command serially to indicate that new message is received.

```
+CMTI: "SM",3
```

In the above command number 3 indicates the location of the new message. Now we need to read this unread message to display it on LCD. The command to read the message from GSM modem is

```
at+cmgr=3
```

Here the number 3 indicates the location of the message to be read. After sending this command to GSM module, modem sends the below command serially.

```
+CMGR: "REC UNREAD", "MD-WAYSMS", "13/05/21,15:31:48+34"
forward
```

In the above command "REC UNREAD" indicates that message is unread message, "MD-WAYSMS" indicates sender mobile number or name, 13/05/21 indicates the date, 15:31 indicates time and forward is the content of the message.

From the above command, we need to extract message (forward) sent by the user. Now compare this message with predefined strings (forward, backward, left, right), based on result control the robot.

Block Diagram:

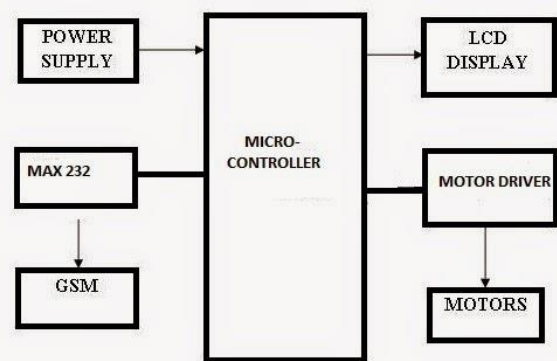


Figure 1.8

Circuit Design:

The major components used in the above circuit are microcontroller, motor driver, level converter, GSM module and robot. Here at89c51 microcontroller is used and it requires a power supply of positive 5V DC. In order to provide regulated 5V DC voltage to the controller, use 7805 power supply circuit. Here two 9V batteries are used, one is for giving the supply to the circuit and other is to run the DC motors.

In the above circuit, 16 x 2 LCD is connected to the PORT1 of the microcontroller in 4 bit mode. LCD data lines D4, D5, D6 and D7 are connected to P1.4, P1.5, P1.6 and P1.7 respectively and control pins are connected to P1.0, P1.1 and P1.2. Here it used to indicate the received message.

GSM modem Tx and Rx pins are connected to the 13 and 14 pins of max232. Microcontroller TXD and RXD pins are connected to the 11 and 12 pins of level converter. Here max232 is a mediator between controller and GSM module and it is used to convert the voltage levels. To know more details about max232 refer Max232 Datasheet.

GSM module requires 5V power supply. In order to communicate with this GSM we need to send AT commands using serial communication (UART protocol). Use a baud rate of 9600 to communicate with GSM.

P2.0, P2.1, P2.2 and P2.3 pins of controller are connected to the L293d input pins and these pins are used to control the two

DC motors. The operating voltage of this IC is 5V. Using this IC we can operate the 2 DC motors with a voltage ranging from 4.5 to 36V. We need to apply the motors supply at 8th pin of L293d. To know more about motor driver IC refer L293D Datasheet.

Circuit Working Algorithm:

Initialize the LCD and UART protocol

Continuously check for the command +CMTI: "SM",3 (Location number) to know weather new message is received or not

If you receive the command then store message location number.

Now read that particular message and extract the body of the message

Display the extracted content on LCD and compare this content with predefined strings.

If matched then perform the necessary action on robot.

Use below code to read a new message from the GSM modem.

```
while (rx_data() != 0x0d);
while (rx_data() != 0x0a);
if (rx_data() == '+')
{
if (rx_data() == 'C')
{
if (rx_data() == 'M')
{
if (rx_data() == 'T')
{
if (rx_data()=='I')
{
while (rx_data() != ',');
a = rx_data ();
delay_ms (10);
tx_string ("at");
tx_data (0x0d);
tx_data (0x0a);
tx_string ("at + cmgf=1");
tx_data (0x0d);
tx_data (0x0a);
tx_string ("at + cmgr=");
tx_data (a);
tx_data (0x0d);
tx_data (0x0a);
while (rx_data() != 0x0a);
while (rx_data() != 0x0a);
while (rx_data() != 0x0a);
for (i=0; i<15; i++)
{
read [i]= rx_data();
}
lcd_stringxy(1,0,read);
delay_ms (5000);
}
}
}
}
}
```

How to Operate?

1. Write the program to the GSM controlled robot project using keil software
2. Now burn the program to the microcontroller with the help of flash magic.
3. Give the connections as per the circuit diagram.

4. Use power supply circuit to provide 5V DC to the microcontroller
5. Insert the SIM (Subscriber Identity Module) to the GSM module.
6. Now switch on the supply
7. Send SMS to the GSM module using other mobile
8. Now you can see the same message on LCD.
9. If the received message match with any predefined string then robot moves accordingly.

Circuit Applications:

- This project is used in robotic applications
- Used in military applications.

Limitations of the Circuit:

- Robot section must have the network to receive the commands wirelessly.
- As there is no password any one can operate the robot by sending message.

III. RESULT AND DISCUSSION

By developing this motor with GSM module by providing immediate text alert to the user. The main feature of this robot is that it is password protected and authenticated so that unauthorized person cannot communicate with the robot at any cost. the error occurred in the motor is identified by using buzzer and rectified immediately. this system of application can be used in home security ,industries , rescue operation, ect,

S.no.	Direction	M1	M2	M3	M4
1.	FORWARD	ON	ON	ON	ON
2.	BACKWARD	ON	ON	ON	ON
3.	LEFT	ON	OF F	ON	OF F
4.	RIGHT	OF F	ON	OF F	ON
5.	STOP	OF F	OF F	OF F	OF F





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