

GSM Based DC MOTOR CONTROL

Sawan Kumar¹, Vikrant², S. K. Dubey³

¹UG Student of ECE Branch, AIMT G Noida

²Assistant Prof, ECE, AIMT G Noida

³Director, AIMT G Noida

ABSTRACT

Global system for mobile communication (GSM) is a wide area wireless communication system that use digital radio transmission to provide voice, data and multimedia communication services. A GSM system coordinates the communication between a mobile telephones (mobile stations), base station (cell sites), and switching systems. Each GSM radio channel is 200 kHz wide channels that are further divided into frames that hold 8 time slots. GSM was originally named Group Special Mobile. The GSM system includes mobile telephone (mobile station), radio towers (base station), and interconnecting switching systems.

GSM (SMS) Controlled DC Motor is automatic control system which capable of receiving a set of command instructions in the form of Short message service and performs the necessary actions like Start, Stop and speed control .WE will be using a dedicated modem/mobile at the receiver module i.e. with the robot itself and send the commands using SMS service as per the required actions. The mobile unit which is dedicated at the motor drive is interfaced with an intellectual device called Micro controller so that it takes the responsibility of reading the received commands in the form of SMS from the mobile unit and perform the corresponding predefined tasks such as motor start, stop, motor direction and speed control at different levels etc.

I. INTRODUCTION

GSM (SMS) Controlled DC Motor is automatic control system which capable of receiving a set of command instructions in the form of Short message service and performs the necessary actions like Start , Stop and speed control. We will be using a dedicated modem/mobile at the receiver module i.e. with the robot itself and send the commands using SMS service as per the required actions. The mobile unit which is dedicated at the motor driver is interfaced with an intellectual device called Micro controller so that it takes the responsibility of reading the received commands in the form of SMS from the mobile unit and perform the corresponding predefined tasks such as motor start, stop, motor direction and speed control at different levels etc.

A. INTRODUCTION TO GSM

Global system for mobile communication (GSM) is a **wide area wireless communications** system that uses digital radio transmission to provide voice, data, and multimedia communication services. A GSM system **coordinates** the communication between a mobile telephones (**mobile stations**), **base stations** (cell sites), and **switching systems**. Each GSM radio channel is 200 kHz wide channels that are further divided into frames that

hold 8 time slots. GSM was originally named Groupe Special Mobile. The GSM system includes mobile telephones (mobile stations), radio towers (base stations), and interconnecting switching systems.

This figure shows an overview of a GSM radio system. This diagram shows that the GSM system includes mobile communication devices that communicate through base stations (BS) and a mobile switching center (MSC) to connect to other mobile telephones, public telephones, or to the Internet. This diagram shows that the MSC connects to databases of customers. This example shows that the GSM system mobile devices can include mobile telephones or data communication devices such as laptop computers.

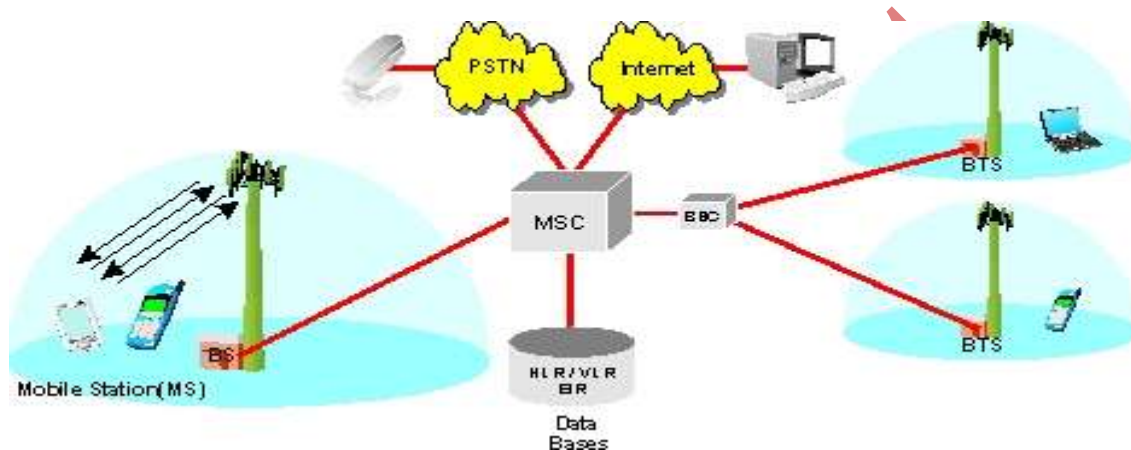


Fig.1 Global System for Mobile Communication - GSM System Diagram

This diagram shows that the **GSM** system uses a single type of **radio channel**. Each radio channel in the GSM system has a frequency bandwidth of **200 kHz** and a **data transmission rate** of approximately **270 kbps**. This example shows that each radio communication channel is divided into **8 time slots** (0 through 7). This diagram shows that a simultaneous two-way voice communication session requires at least one radio channel communicates from the base station to the mobile station (called the forward channel) and one channel communicates from the mobile station to the base station (called the reverse channel). This example also shows that some of the radio channel capacity is used to transfer voice (traffic) information and some of the radio channel capacity is used to transfer control messages.

B. BENEFITS OF GSM

- a. **EmergencyResponse:** 112 is now a universal emergency number among GSM networks. No matter where the user is, if they are using GSM, they can call for help.
- b. **TechnologicalGrowth:** The growth of communications technology has been prompted by worldwide competition, allowed by the universality of GSM. This has lead to a reliable cell-phone service and improved quality in both connection stability and ease.
- c. **UniversalDataTransfer:** The Global System for Mobile Communications allows for reliable and efficient data transfer. It even allows text and pictures to be sent from anywhere the system is available.

- d. **Better sound:** As digital carrier, a GSM cell phone makes for clearer connections. as it can filter background noise. This makes communication, despite distance easy.
- e. **Greater Security:** Due to the way it's designed, a call needs to request access. This is a safety features that makes sure that only the caller and the receiver are in the conversation.

2. BLOCK DIAGRAM

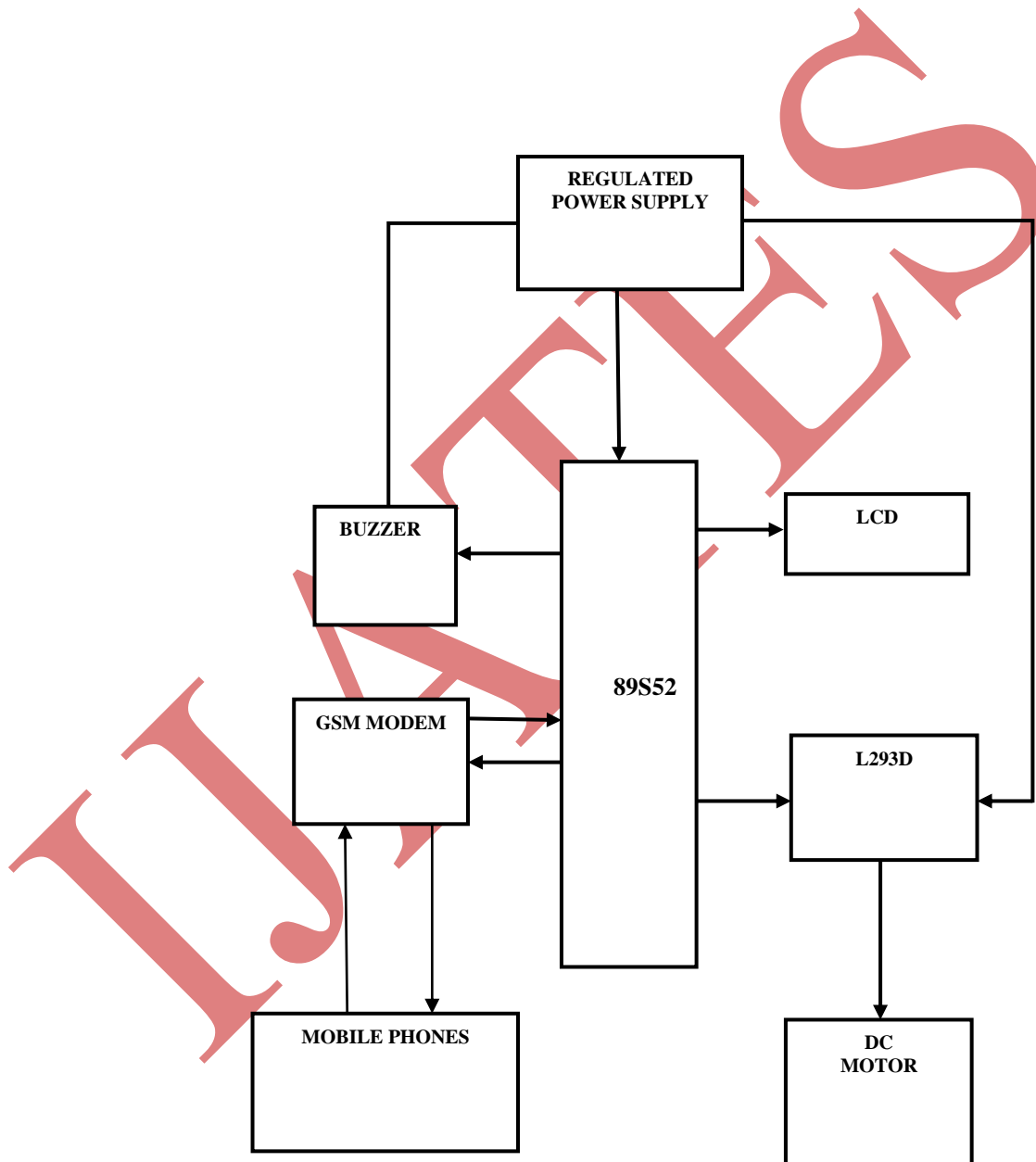


Fig.2. Block Diagram

3. CIRCUIT DIAGRAM

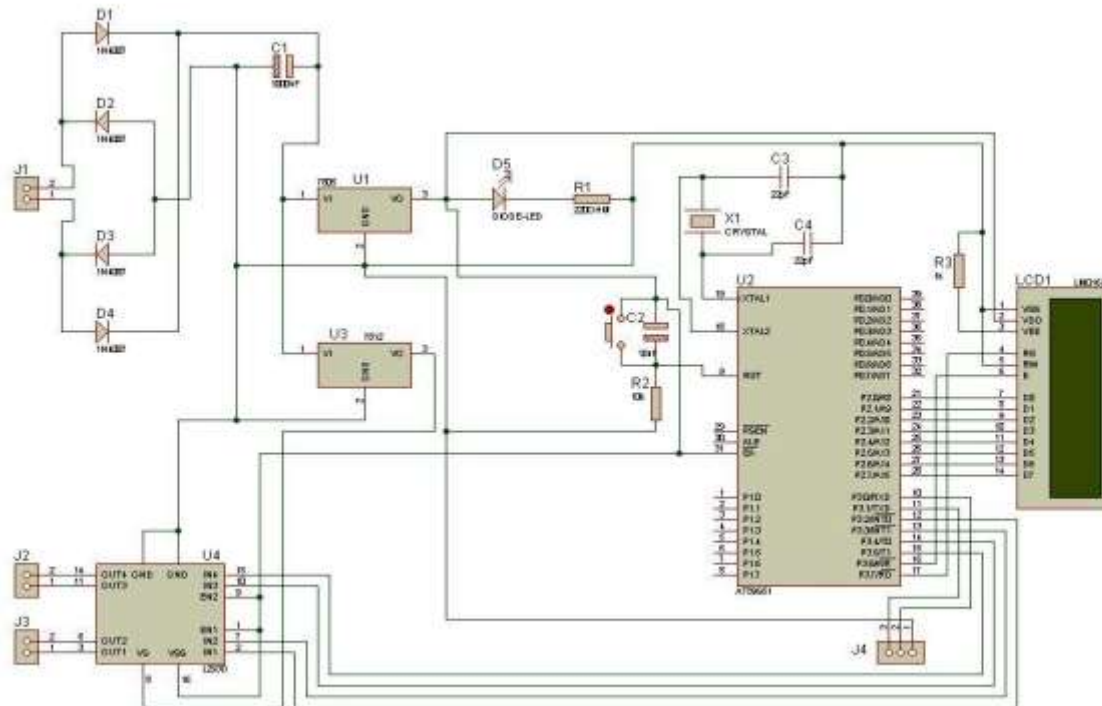


Fig.3.0 Circuit Diagram

4. GSM MODEM

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. Like a GSM mobile phone, a GSM modem requires a SIM card from a wireless carrier in order to operate [11].

A. Accessing GSM MODEM using Microsoft HyperTerminal

Microsoft HyperTerminal is a small program that comes with Microsoft Windows. We use it to send AT commands to the GSM modem. It can be found at *Start -> Programs -> Accessories -> Communications -> HyperTerminal*. Before programming our SMS application, it is required to check if the GSM modem and SIM card are working properly first [12]. The MS HyperTerminal is a handy

tool when it comes to testing the GSM device. It is a good idea to test the GSM devices beforehand. When a problem occurs, sometimes it is difficult to tell what causes the problem. The cause can be the program, the GSM device or the SIM card. If GSM device and SIM card with MS HyperTerminal are operating properly, then it is very likely that the problem is caused by the program or other hardware [12]. For Linux users, Minicom can be used instead of HyperTerminal.

B. Testing of GSM Modem

To use MS HyperTerminal to send AT commands to the GSM modem, the following procedure is followed

1. I put a valid SIM (MTN) card into the GSM modem. I obtain a SIM card by subscribing to the GSM service of a wireless network operator.
 2. No need to install any driver for the GSM modem
 3. Then I set up MS HyperTerminal by selecting *Start -> Programs -> Accessories -> Communications -> HyperTerminal*.
 4. In the *Connection Description* dialog box (as shown in the screenshot given below), I enter any file name and choose an icon I like for the connection. Then I click the *OK* button.
- . In the *Connect To* dialog box, choose the COM port that your mobile phone or GSM modem is connecting to in the *Connect using* combo box. I choose COM1 because my mobile phone is connected to the COM1 port. Then click the *OK* button. Type "AT" in the main window. A response "OK" will be returned from the mobile phone or GSM modem. Type "AT+CPIN?" in the main window. The AT command "AT+CPIN?" is used to query whether the mobile phone or GSM modem is waiting for a PIN (personal identification number, i.e. password). If the response is "+CPIN: READY", it means the SIM card does not require a PIN and it is ready for use. If my SIM card requires a PIN, you need to set the PIN with the AT command "AT+CPIN=<PIN>".

C. List of Important AT Commands

After successfully testing the MODEM for its correct operational state, I then set the MODEM parameters like Baud rate, Echo off etc to enable easier access via a microcontroller which I used in this project. The following are the ATCOMMAND used for programming the GSM modem

Example: Changing and saving parameters

AT+IPR=9600[Enter] Transfer rate to 9600bps

AT&W [Enter] save parameters

AT+CMGF means convert the message to machine instruction format

AT+CPMS means selection of SMS memory

AT+CMGR means read message from a given memory location

AT+CMGD means delete message from a given memory location.

D. .Microcontroller – Modem Interfacing

DTE and DCE

The terms DTE and DCE are very common in the data communications market. DTE is short for Data Terminal Equipment and DCE stands for Data Communications Equipment. As the full DTE name indicates this is a piece of device that ends a communication line, whereas the DCE provides a path for communication. Let's say I have a computer on which wants to communicate with the Internet through a modem and a dial-up connection. To get to the Internet I tell my modem to dial the number of my provider. After my modem has dialed the number, the modem of the provider will answer my call and I will hear a lot of noise. Then it becomes quiet and I see my login prompt or my dialing program tells me the connection is established. Now I have a connection with the server from my provider and I can surf the Internet [13].

E. Microcontroller – LCD Interfacing

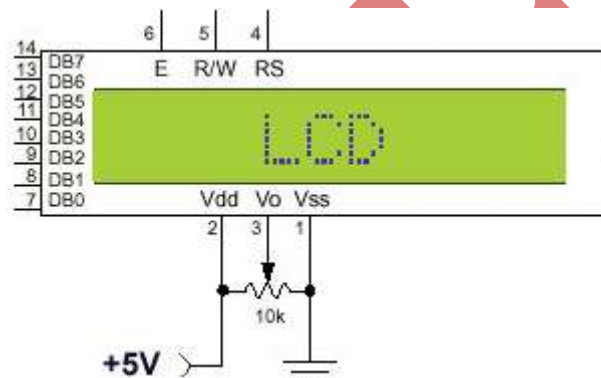


Fig.4 Microcontroller – LCD Interfacing

Above is the quite simple schematic. The LCD panel's *Enable* and *Register Select* is connected to the Control Port. The Control Port is an open collector / open drain output. Therefore by incorporating the two 10K external pull up resistors, the circuit is more portable for a wider range of computers, some of which may have no internal pull up resistors. I make no effort to place the Data bus into reverse direction. Therefore I had wire the *R/W* line of the LCD panel, into write mode. This will cause no bus conflicts on the data lines. As a result I cannot read back the LCD's internal Busy Flag which tells us if the LCD has accepted and finished processing the last instruction [20]. This problem is overcome by inserting known delays into my program. The 10k Potentiometer controls the contrast of the LCD panel. Nothing fancy here.

I used a power supply of 5volt. The user may select whether the LCD is to operate with a 4-bit data bus or an 8-bit data bus. If a 4-bit data bus is used, the LCD will require a total of 7 data lines. If an 8-bit data bus is used, the LCD will require a total of 11 data lines [20]. LCD with 8-bit data bus is used for this design. The three control lines are **EN**, **RS**, and **RW**. EN line must be raised/lowered before/after each instruction sent to the LCD regardless of whether that instruction is read or write text or instruction. In short, I manipulate EN when communicating with the LCD.

F. Simulator

KEIL Micro Vision is an integrated development environment used to create software to be run on embedded systems (like a microcontroller). It allows for such software to be written either in assembly or C programming languages and for that software to be simulated on a computer before being loaded onto the microcontroller. The software used is c programming

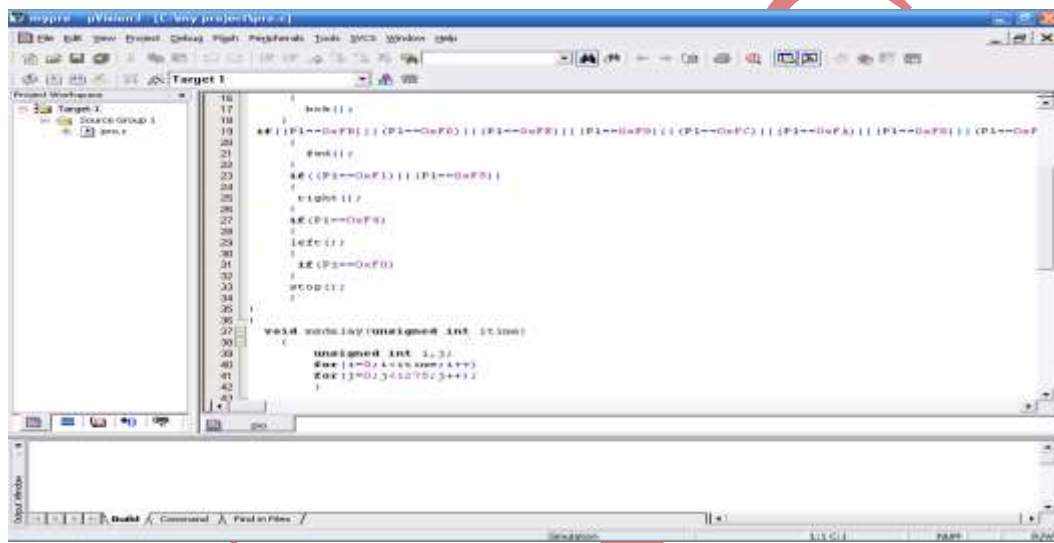


Fig.5 Simulator

μ Vision3 is an IDE (Integrated Development Environment) that helps write, compile, and debug embedded programs. It encapsulates the following components:

- A project manager.
- A make facility.
- Tool configuration.
- Editor.
- A powerful debugger.

V. CONCLUSION

The prototype of the GSM based Generator Control device was efficiently designed. This prototype has facilities to be integrated with a Generator thus making it truly mobile. The toolkit accepts the SMS, stores it, validates it and perform specific operations. The SMS is deleted from the phone each time it is read, thus making room for the next SMS. Problem that were Encountered

- During soldering, many of the connection become short ckted. So we desolder the connection and did soldering again.

- A leg of the crystal oscillator was broken during mounting. So it has to be replaced.
- LED`s get damaged when we switched ON the supply so we replace it by the new one.
- TROUBLESHOOT
- Care should be taken while soldering. There should be no shorting of joints.
- Proper power supply should maintain.

REFERENCES

- [1] The 8051Microcontroller by Kenneth J. Ayala
- [2] The 8051Microcontroller and Embedded Systems by Muhammad Ali Mazidi.
- [3] Principles and Applications of GSM by Vijay Garg.
- [4] Artificial Intelligence – Elaine Rich & Kevin Knight, Tata Mc Graw Hill, 2nd Edition.
- [5] Artificial Intelligence – A Modern approach – Stuart Russel and Peter Norving, Pearson Education, 2nd Edition.
- [6] Introduction to Robotics – P.J.Mc Kerrow, Addison Wesley, USA, 1991 Bernard Sklar, *Digital Communications: Fundamentals and Applications*, Prentice Hall, 2001.
A. Clark and R. Harun, Assessment of kalman -_olter channel estimators for an HF radio link," *IEE Proceedings*, vol. 133, pp. 513{521, Oct 1986.
- [7] ETS 300 502. European Digital Cellular Telecommunication System (Phase 2); Teleservices Supported by a GSM Public Land Mobile Network (PLMN). *European Telecommunications Standards Institute*. September 1994.
- [8] Matthew C. Valenti and Jian Sun, *Chapter 12: Turbo Codes*, Handbook of RF and Wireless
- [9] *GSM Multiple Access Scheme*, <http://www.eecg.toronto.edu/~nazizi/gsm/ma/> William Stallings *Data and Computer Communications 7th Edition: Chapter 9 Spread Spectrum*, <http://juliet.stfx.ca/~lyang/csci-465/lectures/09-SpreadSpectrum-new.ppt>
- [10] ETS 300 608. Digital Cellular Telecommunication System (Phase 2); Specification of the Subscriber Identity Module-Mobile Equipment (SIM-ME) Interface. *European Telecommunications Standards Institute*. May 1998.
- [11] ETR 100. European Digital Cellular Telecommunication System (Phase 2); Abbreviations and Acronyms. *European Telecommunications Standards Institute*. April 1995.
- [12] Jorg Eberspacher and Hans-Jörg Vögel. *GSM Switching, services and Protocols*. John Wiley and Sons, 1999.
- [13] Klaus Vedder GSM: Security, Services, and SIM. State of the art in Applied Cryptography. *Course on Computer Security and Industrial Cryptography*. Leuven, Belgium, June 3-6, 1997.