

CALL AND SEND MESSAGES BY USING GSM MODULE

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Abstract

This research focuses on the construction and control of GSM module with Arduino Mega by using AT commands which are the instructions used to control a modem. The construction of circuit comprises 8-bit microcontroller ATmega-328P, GSM module (SIM 900A), 16x2 liquid crystal display, 4x4 keypad, GSM SIM card and power supply. GSM module is used to communicate with the mobile phone network for calling and messaging purpose. The system used in this research can act as a simple mobile phone using Arduino Mega. GSM module is used as an interface between Arduino and any other mobile phones to make the connections for this system. C++ programming language is used for the codes to operate the whole system. A program code is loaded into the ROM of ATmega-328P microcontroller and runs the commands. The system can make the calls and send the messages to any phone number.

Keywords: AT commands, GSM module (SIM 900A), ROM, Arduino Mega, ATmega-328P,

Introduction

GSM stands for Global System for Mobile communications. This is a global standard to use GSM modules inside the cellular phones for connecting with any mobile network around the world. In certain applications, the microcontroller-based systems must be connected with the GSM network which will enable a user to control the system by sending messages or making a call. The systems can also send messages to the user to alert or inform about the status of the system running.

For all of such cases, a separate GSM module is used rather than using the mobile phone. The advantage of using a GSM communication with a system or device is that the user can control the system wirelessly no matter how far it is as long as both the user and the device are in a cellular coverage area, compared to any other wireless communication.

The Arduino can communicate with the other devices using its digital I/O, serial port, I2C port, SPI port and etc.

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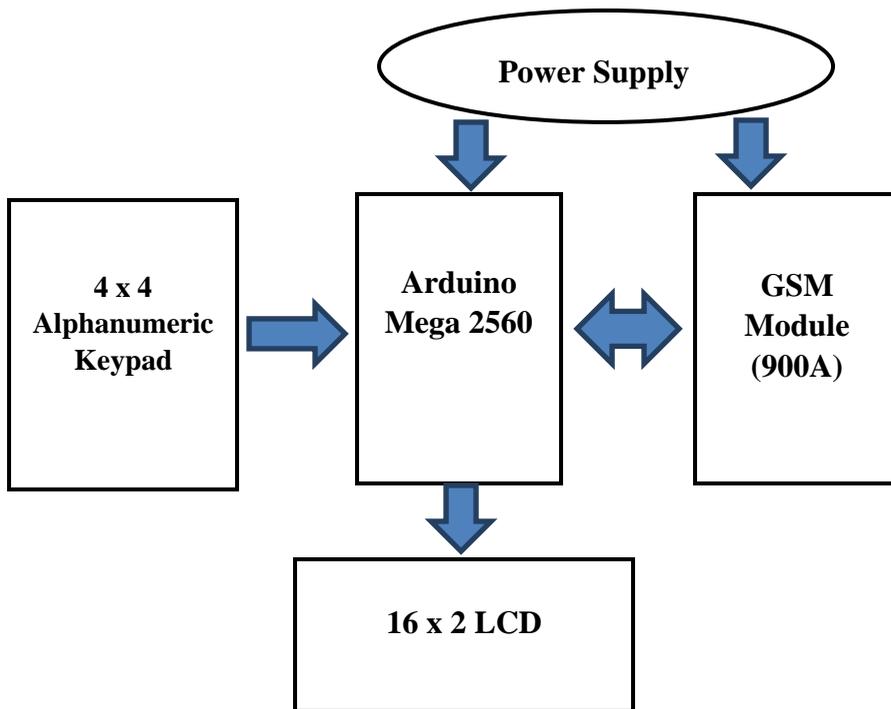


Figure 1: Block diagram of the call and send messages by GSM module

GSM module is used as an interface between Arduino and any other mobile phones to make the connections for this system. A GSM Module is basically a GSM Modern (like SIM 900A) connected to a printed circuit board (PCB) with different types of output taken from the board. The block diagram of calling and sending messages by GSM module is shown in Figure 1.

Function of Components in The Circuit

In this research, Arduino Mega 2560 is used to control the features of whole system and interface all the components in the system. GSM module is used to communicate with the mobile phone network for calling and messaging purpose. A 4x4 alphanumeric keypad is used for taking all kind of inputs including entering mobile number, typing messages, making a call and sending SMS. All of the features will be performed by using alphanumeric keypad. Alphanumeric is a method to enter the numbers and alphabets both by

using the same keypad. The 2x16 LCD is used to show the messages, instructions and alerts.

Circuit Diagram and Construction of the Circuit

Insert the SIM card by locking it to GSM module, connect the adapter to GSM module and turn it ON. Circuit Diagram of the system for interfacing GSM SIM900A and Arduino is shown in Figure 2. The following pins of 16x2 LCD: RS, EN, D4, D5, D6 and D7 are connected with pin number 24, 25, 26, 27, 28 and 29 of Arduino respectively. RX and TX pins of GSM module are directly connected to pins of Arduino: D0 and D1 respectively.

The 4x4 keypad Row pins: R1, R2, R3 and R4 are directly linked to pin number 11, 10, 9, 8 of Arduino and Colum pins of keypad: C1, C2, C3 and C4 are linked with pin number 7, 6, 5, 4 of Arduino. The flowchart diagram of the circuit can be seen in Figure 3.

Operation of the Circuit

When the system received the +5V power supply voltage, it will be searching for the network. If the system is ready to use, Call → C and SMS → B will be displayed on the LCD. And pressing 'B' from keypad will lead to 'Initializing SMS', and if 'Enter No and Press 'D' is performed, after that 'Enter Rept No:' will appear successively on the LCD screen. The user needs to press the key 'D' after typing the phone number through keypad. As soon as 'Enter your SMS' will appear, the text can be pressed and the user has to press the key 'D'. After pressing the 'D', 'Sending SMS' will appear while GSM module is working and 'SMS sent' will be displayed after sending the message. The phone of recipient will receive the message. This system will be back to the ready state by showing Call → C and SMS → B again on LCD screen after performing the messaging command.

When the user presses the key 'C', 'After Enter No.', 'Press C to Call' and then, 'Enter Number' will appear. In this time, the user can press the phone numbers, and key 'C'. Then, the user can receive a call ringing on the phone screen. After the system had done performing the command, it will be waiting for the next command. The photo of the whole circuit is shown in Figure 4.

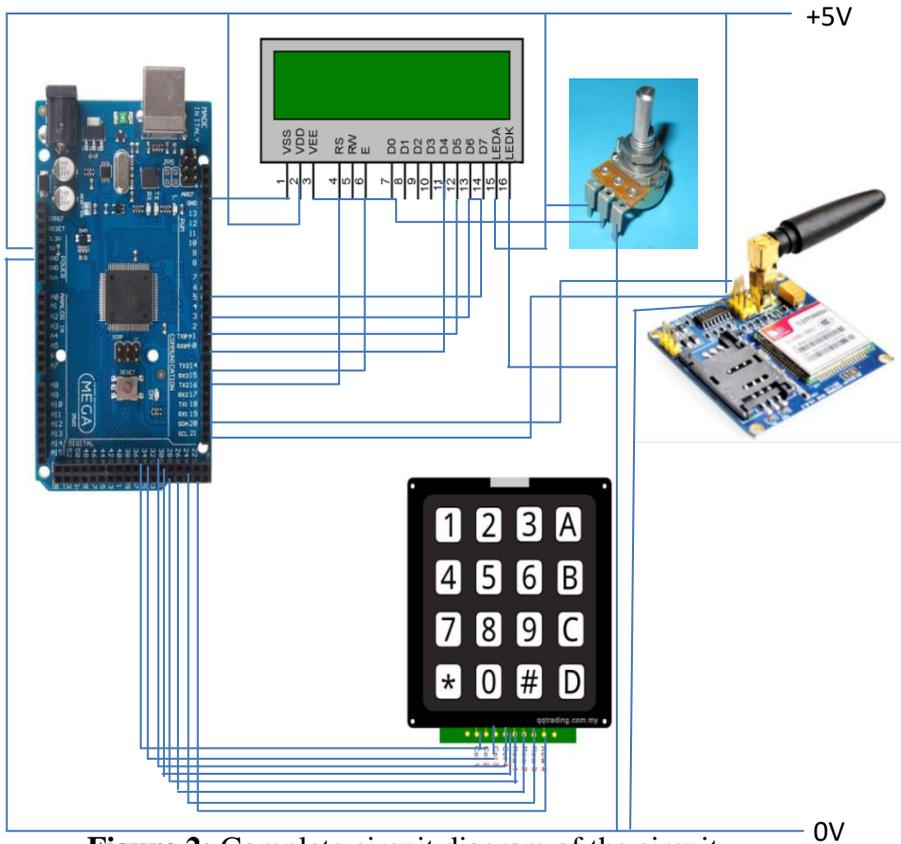


Figure 2: Complete circuit diagram of the circuit

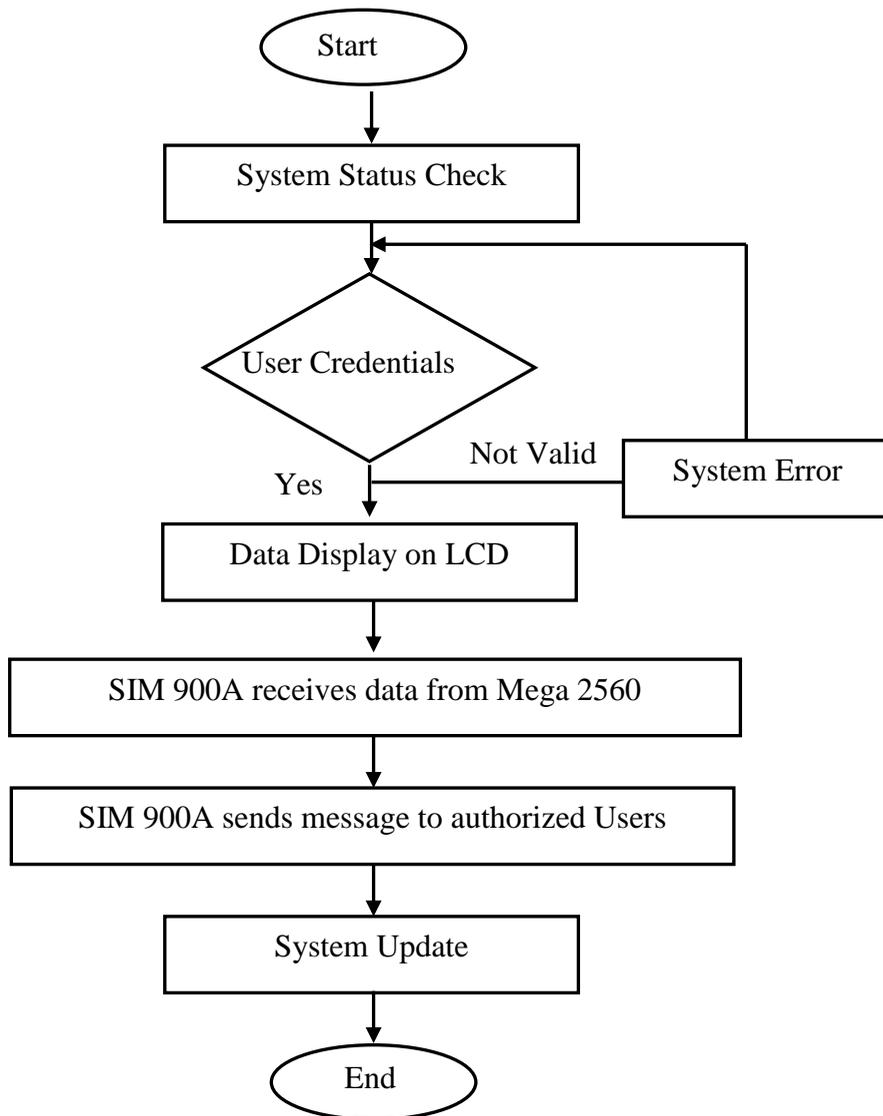


Figure 3: Flowchart diagram of the circuit

Results and Discussion

GSM technology is used to communicate with mobile phones. GSM stands for Global System for Mobile communication. The module supports communications in 900MHz band and power requirement is 5-12V inputs but 5V supply is used for this circuit. Therefore, it is feed 5V and 1A power supply. The GSM shield accepts the card in the mini-SIM format (25mm long and 15mm wide). After the key 'B' from keypad is pressed to send a SMS, the phone number of recipient and text message to be sent can be written from keypad and shown on serial monitor or LCD screen. The phone number of recipient and text message can be edited on serial monitor and LCD screen. When GSM phone receives a message, the text and the number will be shown on phone screen. When the key 'C' is pressed, the phone will be ringing, and the user can see the incoming call on the phone screen. This circuit is tested only for sending messages and making phone calls. This research can be extended by adding receiving messages and phone calls functions for further study. The photo of calling and sending messages using GSM module is shown in Figure 5 and 6.

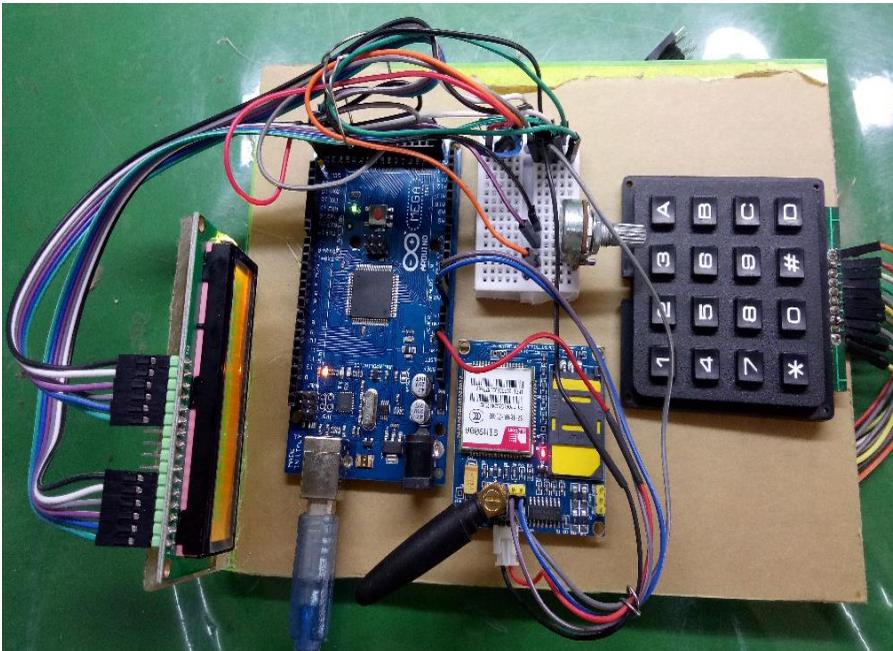


Figure 4: Photo of the call and send messages circuit using GSM Module

Conclusion and Future Work

This circuit was costly and not compacted but it is easy to use for everyone. This device allows only commendable SIM card number. This research makes sure for the researcher to get a great deal of knowledge about GSM technology. The system can be used to connect, making a phone call and sending messages. The advantage of using a GSM communication with a system or device is that the user can control the system wirelessly no matter how far it is as long as both the user and the device are in a cellular coverage area, compared to any other wireless communication. This is a flexible way to control and explore the services of the mobile. AT commands are used in the system. This system is tested only one-sided communication, for calling and messaging from GSM modem which is connected to the Arduino to any kind of mobile network.



Figure 5: Photo of the calling the phone using GSM module

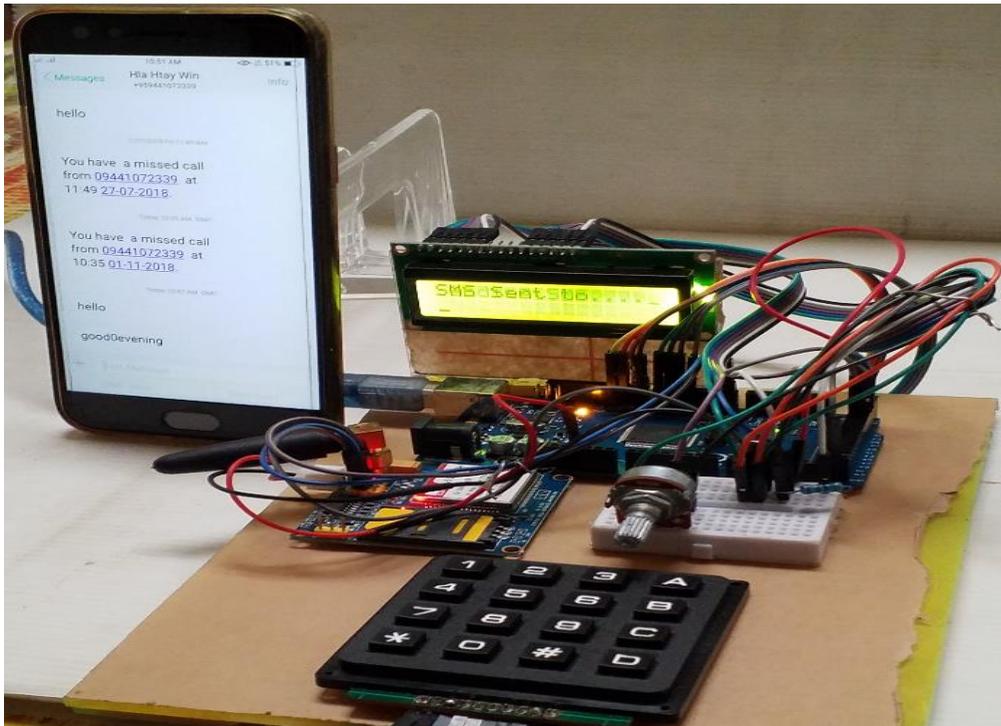


Figure 6: photo of the sending the message using GSM module

The system presented in this research is the first step which made to realize the design of a cell phone by exploring various material, shapes and some functions. The application can be upgraded by adding new functionalities such as receiving text messages, receiving phone calls, rejecting an incoming call, including a phone book and a caller ID, and showing the time.

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