

# Wireless Display using GSM and Arduino

Keshav Kumar<sup>1</sup>, Kumari Ritu<sup>2</sup>, Mrigangna Singh<sup>3</sup>, Mangal V.Patil<sup>4</sup>

<sup>1,2,3</sup>Student, Electronics Department, College of Engineering, Bharati Vidyapeeth Deemed to be University, Pune, Maharashtra, India

<sup>4</sup> Assistant Professor, Electronics Department, College of Engineering, Bharati Vidyapeeth Deemed to be University, Pune, Maharashtra, India

## ABSTRACT

This paper proposes the idea of a GSM based wireless display system which deals with the issue of reduction of orthodox techniques for large scale display using paper or other methods. It discusses the wireless display on digital notice board using GSM module and Arduino. The project consists of GSM module, Arduino as the microcontroller and an LCD for display. The system is based on real time process and provides a more hassle-free and automated method for mass display. With the world moving towards more and more automation day by day, the proposed system proves to be a boon in the field of mass communication.

**Keywords:** GSM Module, Arduino, LCD Display

## I. INTRODUCTION

With the recent advancements in technology, more and more of the day-to-day applications are becoming wireless. The need to go wireless and digital not only provides a more viable option but also increases the efficiency. The reduction of paperwork not only acts as an environmental friendly factor but also makes it human labour free.

In the past scenario, where there was a lack of advanced technologies like wireless communication and automation, the most common method for display at public places was pen and paper. Not only was it a more tedious job, but the consumption and wastage of paper made it environment unfriendly.

Hence this new system was brought as a change to overcome the limitations of the previous techniques. It consists of GSM Modem, SIM, power supply, LCD and arduino. The previous system involved the

process of typing the message in a PC, then transferring it to a USB which was then plugged into a display board to display the message.

Thus, this project takes inspiration from the implementation of wireless communication between a mobile phone and microcontroller. Even in the absence of an authorized person at the location, any message can be displayed anywhere in the world just by sending an SMS from the registered SIM of a mobile phone.

The project finds its application in Smart City Project, public places like hotels, malls, colleges, cinema halls and even home. For instance, one can set the message like "Do not disturb" at one's hotel's room gate, or at one's home's door step to display and can send it using mobile phone when away.

## II. LITERATURE REVIEW

1. *Guifen Gu and Guili Peng*. [1]The authors and their mentioned paper covers the areas

regarding GSM: its applications, advantages and limitations. It also explains in detail the importance of GSM as the most famous system for the Second Generation mobile telephony all over the world.

2. *N.Jagan Mohan Reddy and G.Venkeshwaralu:* [2] The authors and their mentioned paper explains a photo type laboratory model wireless notice board system. In this paper the board is connected to a GSM modem which allows the user to display the message on the board using SMS feature.
3. *Foram Kamdar, Anubhav Malhotra and Pritish Mahadik:* [3] The paper of the mentioned authors brings forth the environmental friendliness of the proposed system. It lays emphasis on the conservation of time and energy.
4. *Shruthi K., Harsha Chawla, Abhishek Bhaduri:* [4] The paper presented by these authors covers and explains in detail the existing system of notice board display. It brings forth the importance of Smart Notice Board and its efficiency.

### III. SYSTEM OVERVIEW

The system consists of two parts: Hardware and Software.

#### A. Hardware:

The hardware part consists of

- GSM Modem
- SIM
- LCD
- Arduino

1. *GSM Modem:* The GSM Modem, as shown in Figure 1, works by accepting any GSM network operator SIM card acts just like a mobile phone with its own unique phone number. The advantage of this modem is that its RS232 pin can be used to

communicate and develop embedded application.[5]. The main operation of the modem is to send or receive calls or SMS. For this purpose it can be connected to a PC port directly or to any other microcontroller. The GSM modem acts as a highly flexible plug and its direct and easy integration to RS232 applications plays a significant role.



*Fig. 1. GSM Module*

2. *SIM:* SIM stands for Subscriber Identity Module. It is a chip-on small card which consists of user's information and phone book. The SIM is inserted in a slot available on the GSM Modem. A SIM card contains a unique serial number (ICCID), international mobile subscriber identity (IMSI) number, security authentication and ciphering information. It also stores temporary information related to the local network, a list of the services the user has access to, and two passwords: a personal identification number (PIN) for ordinary use, and a personal unblocking code (PUK) for PIN unlocking. The SIM used in this project is SIM900A.

3. *LCD:* LCD abbreviates for Liquid Crystal Display and is used for display purpose in this system. The LCD used in this proposed system is Jhd162a LCD which is a model of the 16\*2 type LCD which is shown in Figure 2. The basic LCD consists of 3 control lines as well as 4 or 8 I/O lines. The operation of the 4 or 8-bit data bus can be selected by the user according to the requirement.



**Fig. 2. LCD Display**

4. *Arduino*: The microcontroller used in this proposed system is Arduino Uno, shown in Figure 3, which is based on ATmega328P. It has 14 digital input/output pins (of which 6 can be used as PWM outputs), 6 analog inputs and a 16 MHz quartz crystal. It also consists of a USB connection, a power jack, an ICSP header and a reset button. The main operation of the Arduino is to read the SMS received from the GSM module, extract the main message from the received string and store it in another string. The extracted message is then sent to the LCD display through the commands.



**Fig. 3. Arduino UNO**

#### **B. Software:**

The software used in the proposed project is the Arduino Integrated Development Environment - or Arduino Software (IDE) shown in Figure 4. It consists a text editor for writing the code, a message area and some other common functions. It connects to the Arduino hardware to upload programs and for communication[6].



**Fig. 4. Arduino 1.8.5 Programming Interface**

## **IV. IMPLEMENTATION**

### **A. Software Implementation:**

The software implementation, shown in Figure 5, mainly consists of programming using C language. The AT commands are used to operate the GSM modem. AT command, which is used for authentication consists of a message being preceded by '#' and followed by '\*' to indicate start and stop for reading of the message respectively. For example, if the message to be displayed is "Hello", then it is written as "#Hello\*".

### **Algorithm:**

- ✓ Start
- ✓ Check for module connectivity
- ✓ If not connected, find the network.
- ✓ If network is found, type the message through you mobile phone and send it to display over GSM network.
- ✓ Check for the message at the receiver side and also the sender's authentication.
- ✓ If authenticated, then display the new message, else keep on displaying the previous message.

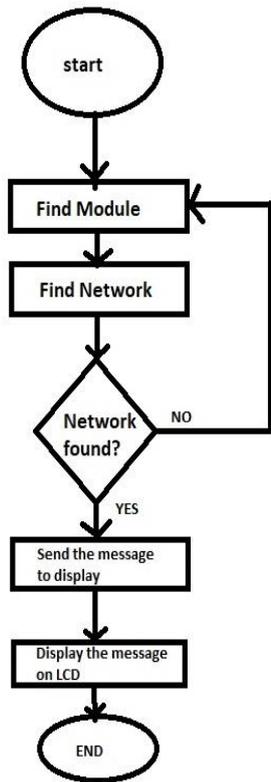


Fig. 5. Flow chart of the specified algorithm

**B. Circuit Implementation:**

The connections in the circuit implementation of the proposed system are as shown in the Figure 6. The LCD, which is used for display purposes has its pins namely RS, EN, D4, D5, D6, and D7, connected to the arduino pins. The Arduino pins used for interfacing are 7, 6, 5, 4, 3, and 2 respectively. The Rx and the Tx pins of the GSM module is connected to the Tx and Rx pins of the Arduino respectively for transmission of message. The GSM module is powered using a 12V adaptor[7].

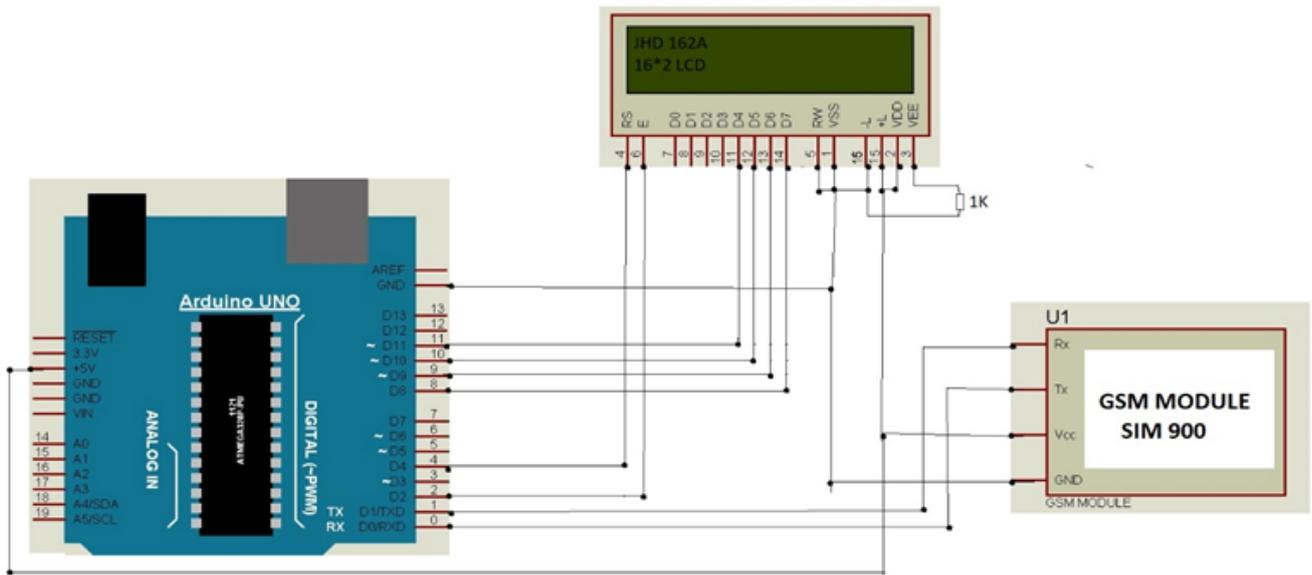


Fig. 6. Circuit design of the model

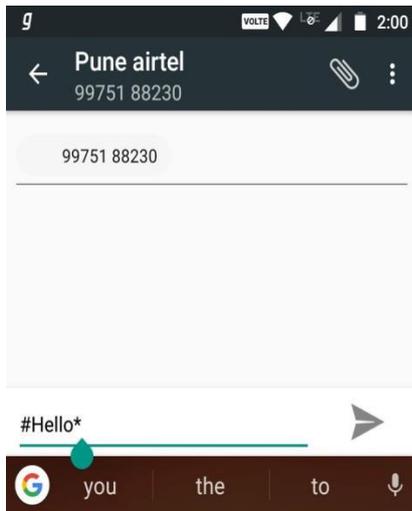
**V. RESULTS**

Initially when power is switched on the default message which is displayed is shown in Figure 7.



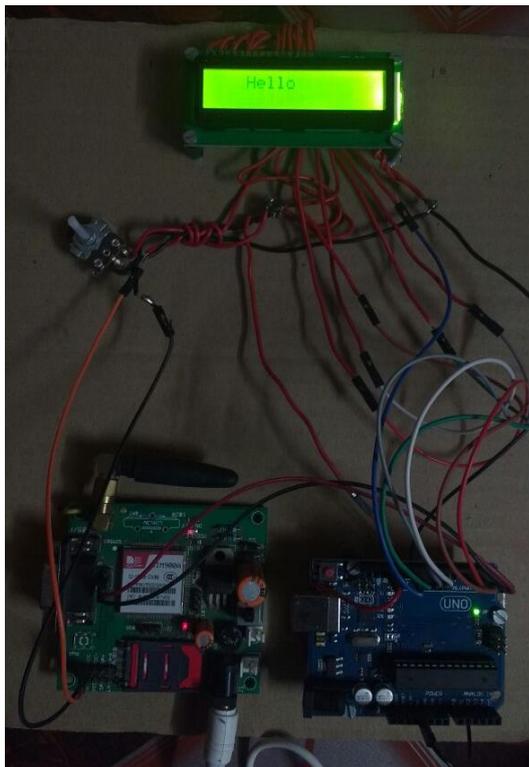
Fig. 7. Welcome message being displayed

As shown in Figure 8, the message “Hello” is send to the registered SIM number of the GSM module. The message after being received by the module is temporarily stored in the SIM card and is then passed to the microcontroller using serial communication.



**Fig. 8. Message being sent from a mobile device**

After transmission and receiving of the message “Hello” it is displayed on the LCD as shown in the Figure 9.



**Fig. 9. Message received, displayed on the LCD**

## V. CONCLUSION

The display boards, being one of the major medium for mass communication, must be efficient enough to cater to the public need instantaneously. This project, which is an idea to make use of GSM communication to various fields, can be efficiently implemented in this system. The proposed system proves its mobility by being easily integrated with almost all general purpose display boards. The major advantages of this system is the increased security along with fast communication and environmental friendliness.

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