

# **WIRELESS DISPLAY USING BLUETOOTH**

ECD334 MINI PROJECT REPORT

Submitted by

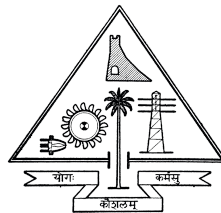
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to

The APJ Abdul Kalam Technological University  
in partial fulfillment of the requirements for the award of the Degree

of

*Bachelor of Technology*  
*In*  
*Electronics and Communication Engineering*



**Department of Electronics and Communication Engineering**

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July 2022

## **DECLARATION**

I undersigned hereby declare that the project report “Wireless Display using Bluetooth”, submitted for partial fulfillment of the requirements for the award of degree of Master of Technology of the APJ Abdul Kalam Technological University, Kerala is a bonafide work done by me under the supervision of Prof. Vijeesh V. This submission represents my ideas in my own words and where ideas or words of others have been included, I have adequately and accurately cited and referenced the original sources. I also declare that I have adhered to ethics of academic honesty and integrity and have not misrepresented or fabricated any data or idea or fact or source in my submission. I understand that any violation of the above will be a cause for disciplinary action by the institute and/or the University and can also evoke penal action from the sources which have thus not been properly cited or from whom proper permission has not been obtained. This report has not been previously formed the basis for the award of any degree, diploma or similar title of any other University.

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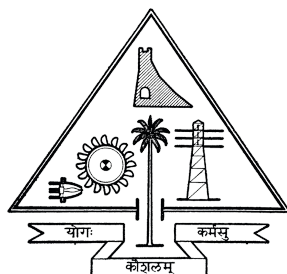
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**CERTIFICATE**

This is to certify that the report entitled '**Wireless Display Using Bluetooth**' submitted by **Abhinand P K, Ananya Amban, Ananya M and Dennis Mathew Jose** to the APJ Abdul Kalam Technological University in partial fulfillment of the requirements for the award of the Degree of Bachelor of Technology in Electronics and Communication Engineering is a bonafide record of the project work carried out by him/her under my/our guidance and supervision.. This report in any form has not been submitted to any other University or Institute for any purpose.

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## **ACKNOWLEDGEMENT**

First and foremost we thank Almighty for his infinite blessings that he has showered on us in every moment of developing this work.

We are thankful to **Prof. Vijeesh V**, Professor, Electronics and Communication Engineering, Government Engineering College, Thrissur, for his full fledged support, advice and coordination.

We are also thankful to **Prof. Mohamed Salih K.K.**, Assistant Professor, Department of Electronics and Communication Engineering, Government Engineering College, Thrissur for his immense support, advice and guidance. And to all the teaching and non-teaching staff of the Department of Electronics and Communication, Government Engineering College, Thrissur, we extend our gratitude. Finally, we would like to thank all our well-wishers and friends who've helped us directly and indirectly to complete this project.

## **ABSTRACT**

The project “Wireless Display Using Bluetooth” is an innovative approach of intimating messages to the people. An electronic display is used that is synchronized using Bluetooth technology to wirelessly display the given messages. As the information displaying is going digital with a high speed nowadays, this project has a very significant role. This will help us in passing any message almost immediately without any delay just by sending input using an app. This method is more reliable and fast when compared to the old process of passing the input content directly onto the display board.

The proposed technology can be used in colleges and many other public places, malls or big buildings to enhance the security system and also make awareness of the emergency situations and avoid many dangers. This kind of display is also useful in very crowded food courts or hospitals where order number and token number have to be displayed outside as calling out to the people is not effective. In the last couple of decades, communication technology has developed by leaps and bounds. It has already established its relevance and importance in sharing information right from household matters to worldwide happenings. We present in this paper the development of a smartphone controlled wireless electronic display which can be updated automatically and remotely. The given system is implemented using an Arduino UNO microcontroller, Bluetooth Module and an LCD Display.

# CONTENTS

Contents	Page No.
ACKNOWLEDGEMENT	4
ABSTRACT	5
LIST OF FIGURES	8
ABBREVIATIONS	9
1.INTRODUCTION	
1.1. General Background	10
1.2. Problem Statement	11
1.3 Objective	11
1.4 Scope	11
2. LITERATURE SURVEY	
2.1 Existing Technologies	12
3. RELEVANCE	15
4. THEORY	
4.1 Proposed System	17
4.2 20X4 LCD Display	18
4.3 HC-05 Bluetooth Module	19
4.4 Arduino Uno	20
5. METHODOLOGY	
5.1. Working Principle	22
5.2. Flow Chart	23

5.3. Components Required	23
5.4. Circuit Diagram	24
5.5. Program	25
6. RESULTS AND DISCUSSION	28
7. CONCLUSION	33
REFERENCES	35

## **LIST OF FIGURES**

1. Paper being used on Notice Board
2. Block Diagram for the proposed system
3. 20x4 LCD Display
4. HC-05 Bluetooth Module
5. Arduino UNO
6. Flow Chart for the proposed system
7. Circuit Diagram of the proposed system
8. Text message sent through app
9. Text message displayed on the LCD display
10. Voice message sent using the app
11. Voice message displayed on LCD as text



## **ABBREVIATIONS**

- GSM : Global System for Mobile communication
- IOT : Internet Of Things
- PIC : Peripheral Interface Control
- LED : Light Emitting Diode
- LCD : Liquid Crystal Display
- SMS : Short Message Service
- Wi-Fi : Wireless-Fidelity
- USB : Universal Series Bus

# **CHAPTER 1**

## **INTRODUCTION**

### **1.1 GENERAL BACKGROUND**

As we look around us, we can witness the growth of wireless technology very evidently. And using this technology for communication purposes has so many advantages. Wireless electronic displays can replace the traditional display boards which are inconvenient to update on a regular basis. We are very familiar with the notice boards present in schools and colleges where information is written or printed on paper and pinned onto the noticeboards. This is time consuming and at the same time leads to wastage of paper. Such notice boards can be replaced with wireless display boards so that the information can be updated using a smartphone wirelessly using Bluetooth technology and also a lot of paper can be saved.

Another scenario where such electronic displays come to use is crowded areas like hospitals and restaurants. In such places, we've seen the people being provided with token numbers and order numbers respectively. Someone usually announces this number over a mic or without a mic. Both the ways are not always effective as the information communicated might not be clear to the people waiting. Instead, a wireless electronic display can be used to avoid confusion. The people can enter by looking at the display board. And, the information can be passed to the display easily by the staff from wherever they are by pairing their smartphone to the display using Bluetooth. A wireless display board using Bluetooth is thus very useful in many different types of situations.

## **1.2 PROBLEM STATEMENT**

- The traditional display boards use paper to give out information to the people. The process of updating associated with such display boards is very time-consuming and inconvenient. It also leads to wastage of paper that in turn leads to environment degradation.
- Token numbers and order numbers not being effectively communicated (as they are calling out instead of using a display) is a common thing in hospitals and restaurants.

## **1.3 OBJECTIVE**

- To design and implement a wireless electronic display into which the input messages can be given using Bluetooth Technology.
- To interface the user's smartphone with the electronic display to give out the latest information. The message can be given through an app as typed input or voice input.

## **1.4 SCOPE**

The proposed system in this paper has many upcoming applications in educational institutions and organizations, crowd management, railways, advertisements etc. Being user friendly and being a faster means of conveying information are major bolsters for this application.

In the future, the range of the network can be increased if needed by making use of Wireless Fidelity.

## **CHAPTER 2**

### **LITERATURE SURVEY**

#### **2.1 EXISTING TECHNOLOGIES**

Various technologies already exist to make wireless communication and wireless display easier. Some of the previous project reports and research papers based on wireless technology that assisted us in developing this project are discussed below.

##### **2.1.1 K. V. S. S. S. Sairam, N. Gunasekaran and S. R. Redd, "Bluetooth in wireless communication," in IEEE Communications Magazine, vol. 40**

Bluetooth is a method for data communication that uses short-range radio links to replace cables between computers and their connected units. Industry-wide Bluetooth promises very substantial benefits for wireless network operators, end workers, and content developers of exciting new applications. This article delves into the implementation and architecture of Bluetooth.

##### **2.1.2 M. Abila Mary, B. Pavithra, R. Sangeetha, Prof.T.C. Subbu Lakshmi, "GSM based wireless noticeboard using Arduino", IJARTET 2019.**

SMS based notice board incorporating the widely used GSM to facilitate the communication of displaying messages on notice board via user's mobile phone. SIM 800 GSM modem with a SIM card is interfaced to the ports of the Arduino with the help of AT commands. They developed a GSM based notice board whose contents can be updated through an SMS which is realized through an embedded system with a microcontroller.

### **2.1.3 Gaurav Bhardwaj, Gunjan Sahu, Rajan Kumar Mishra, “IOT based smart notice board”,IJERT 2020.**

In IOT based Web Controlled Notice Board, Internet is employed to wirelessly send the message from Browser to the display. A local web server is created, this could be a global server over the net. At the PIC microcontroller, an LED matrix is used to display messages and flask for receiving the message over the network.

### **2.1.4 Aliya Farooquie, Aishwarya sakhre, Balaji Bomade, Madhavi badole, Ashwini Ughade, “Design and Implementation of Wireless Notice Board Display based on Arduino and Bluetooth Technology”**

As technology is advancing every day the display board systems are moving from Normal handwriting displays to digital displays. Further to Wireless display units. This paper develops a photo type laboratory model wireless notice board system with GSM Module and BLUETOOTH Module connected to it, which displays the desired message of the user through an SMS in the most populated or crowded places.

### **2.1.5 Pallavi M. Banait, Nikita P. Bakale, Mayuri S. Dhakulkar, Bhushan S. Rakhonde, “Cost effective Android based wireless notice board”, IJETER 2018.**

In this paper, the development of a simple and low cost wireless Android based notice board is presented. The proposed system uses either Bluetooth or Wi-Fi based wireless serial data

communication in displaying messages on a remote digital notice board. Android based Application programs available for Bluetooth and Wi-Fi communication for personal digital assistant (PDA) devices are used for transmitting the alpha-numeric text messages. Using the Bluetooth or Wi-Fi based serial data communication technique, the corresponding transceiver module has been interfaced with the microcontroller board at the receiver end. For this purpose, a low cost microcontroller board (Arduino Uno) is programmed to receive alphanumeric text messages in any of the above selected communication modes.

## **CHAPTER 3**

### **RELEVANCE**

Communication is the act of sharing ideas, emotions and feelings between two or more people. Nowadays, communication is playing a vital role in every walk of an individual's life. Good Communication is of tremendous importance as it improves the efficiency and smoothenes the processes.

Traditional means of communication are being proven ineffective in many fields. Papers being pinned onto the notice boards and posters being glued to the walls are a common sight even now. For continuously updating information, more and more paper has to be used and thus a lot of paper is being wasted per day. From 2010 to 2060, the global consumption of pulp and paper is expected to double. The same will be the amount of paper waste. 93% of paper comes from trees. Paper production causes deforestation, uses enormous amounts of energy and water, and contributes to air pollution and waste problems.

In today's electronic age, it is possible to go paperless. The project proposed in this paper is a step towards a paperless world. Replacing traditional notice boards with wireless electronic displays can eliminate the use of paper and it can also speed up the process of updating information.



Fig 3.1 : Paper being used on notice boards

In many crowded places like hospitals and restaurants, token numbers and order numbers are being provided and after each one, the next number is called out by a staff member. The voice is not always clear in a crowded room and it is common for people to get confused. This problem can be avoided by using a wireless display present outside for the people to view. Such a display board can be operated from the inside by any staff using their smartphone. The proposed system in this paper thus saves energy and makes communication more effective in many scenarios.



## **CHAPTER 4**

### **THEORY**

#### **4.1. PROPOSED SYSTEM**

The proposed system is a wireless display using Bluetooth. The system reads a message from an authorized smartphone and the message is received by the HC-05 Bluetooth module. From the Bluetooth module, the Arduino UNO extracts the message and stores it in its flash memory. From its flash memory the message is transmitted to the 20x4 LCD display and it is displayed in the LCD Display.

The proposed system will have a Bluetooth Module, which can be connected using a smartphone with the help of a home-automation app that can be downloaded from the play store or app store. When the smartphone is connected to the bluetooth module it waits for the user to send a message. The message can be in the form of text input or voice input. When a message arrives, the bluetooth module transmits the message to Arduino UNO. The Arduino first checks whether the length of the input message is greater than 40 characters. If so, the Arduino will send a message to the LCD display to show that the length of the message is out of bounds of display. If the length of the input message is less than 40 characters, Arduino checks the new message with the default message stored in the flash memory. If the message does not match with the default message, Arduino will transmit the new message to the LCD display and we will be able to see the message displayed in the LCD display. Also the Arduino changes the new message as the default message.

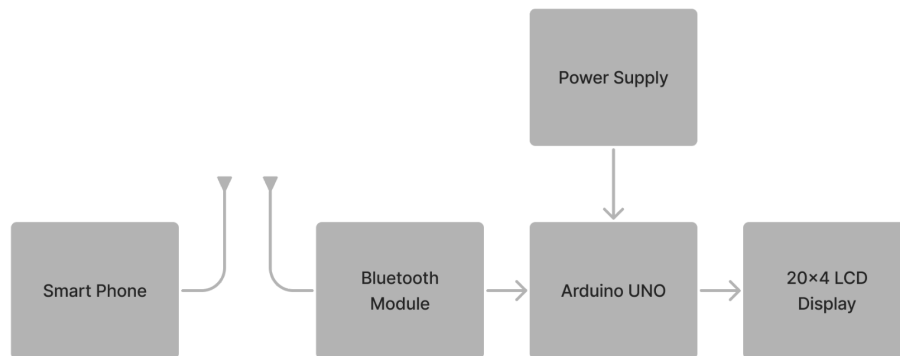


Fig 4.1: Block Diagram of the proposed system

## 4.2. 20x4 LCD DISPLAY

The LCD stands for liquid crystal display, which works on the light modulation features of liquid crystals. It is available in electronic visible display, video display and flat panel display. There are numerous categories and features that exist in markets of LCD and you can see it on your mobile, laptop, computer and television screen. The invention of LCD gives new life to electronic industries and replaces LED and gas plasma techniques. It also replaces the CTR (cathode ray) tube that was used for visual display. The input power consumed by the liquid crystal display is less than light-emitting diodes and plasma display.

A 20x4 LCD display is a very basic module and is very commonly used in various devices and circuits. These modules are preferred over seven segments and other multi segment LEDs. The reasons being: LCDs are economical; easily programmable; have no limitation of displaying special & even custom characters (unlike in seven segments), animations and so on. A 20x4

LCD means it can display 20 characters per line and there are 4 such lines. In this LCD each character is displayed in a 5x7 pixel matrix. This LCD has two registers, namely, Command and Data. This is standard HD44780 controller LCD. There is no change code for interfacing standard 16x2 or 20x4 LCD.

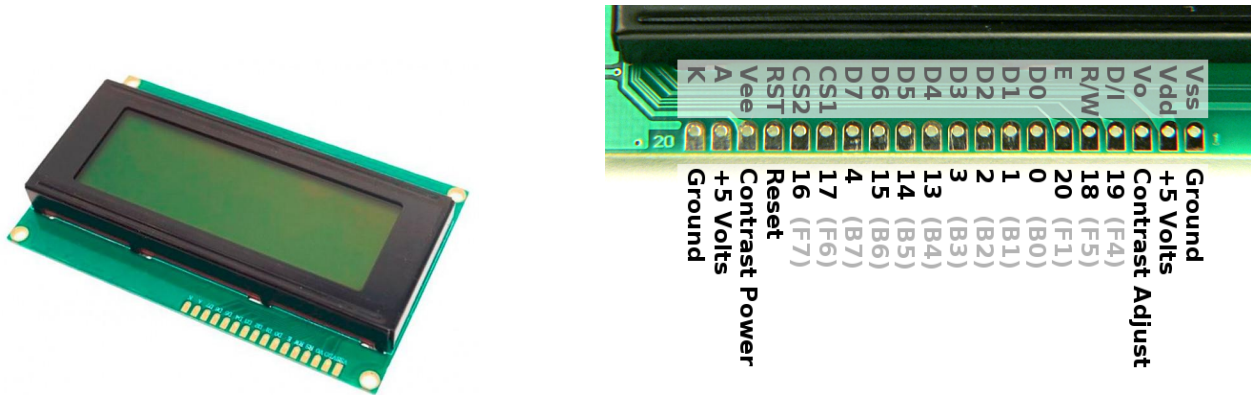


Fig 4.2 20x4 LCD Display

### 4.3 HC-05 BLUETOOTH MODULE

Wireless communication is swiftly replacing the wired connection when it comes to electronics and communication. Designed to replace cable connections, HC-05 uses serial communication to communicate with the electronics. Usually, it is used to connect small devices like mobile phones using a short-range wireless connection to exchange files. It uses the 2.45GHz frequency band. The transfer rate of the data can vary up to 1Mbps and is in range of 10 meters.

The HC-05 module can be operated within 4-6V of power supply. It supports baud rate of 9600, 19200, 38400, 57600, etc. Most importantly it can be operated in Master-Slave mode which

means it will neither send or receive data from external sources. The HC-05 Bluetooth Module can be used in two modes of operation: Command Mode and Data Mode.

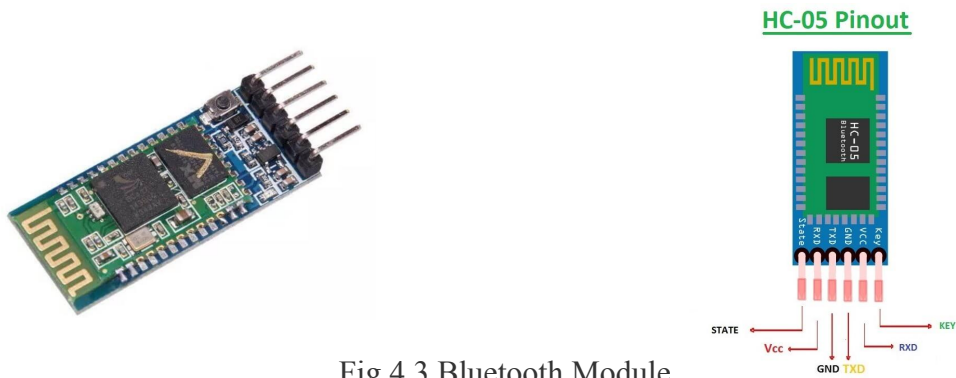


Fig 4.3 Bluetooth Module

#### 4.4 Arduino UNO

The Arduino Uno is a microcontroller board based on the ATmega328. It has 20 digital input/output pins (of which 6 can be used as PWM outputs and 6 can be used as analog inputs), a 16 MHz resonator, a USB connection, a power jack, an in-circuit system programming (ICSP) header, and a reset button. It contains everything needed to support the microcontroller; simply connect it to a computer with a USB cable or power it with a AC-to-DC adapter or battery to get started.

The Uno differs from all preceding boards in that it does not use the FTDI USB-to-serial driver chip. Instead, it features an ATmega16U2 programmed as a USB-to-serial converter. This auxiliary microcontroller has its own USB bootloader, which allows advanced users to reprogram it.

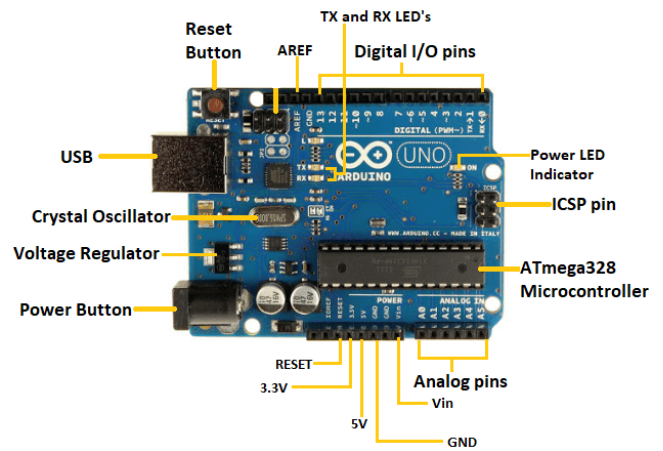


Fig 4.4 Arduino UNO

## **CHAPTER 5**

### **METHODOLOGY**

#### **5.1 WORKING PRINCIPLE**

First, power supply is given to our display board and this turns on all our components. The power supply can be given using a normal adapter. Battery(9V) can also be used to power the system. The HC-05 bluetooth module, after turning on, is ready for pairing. Bluetooth is turned on in the smartphone and it is connected with the bluetooth module using an arduino automation app (such apps are available in the Google play store). The HC-05 bluetooth module can be paired with the smartphone using the password. By default, the password is '0000' or '1234'. This password can be changed to enhance security. After setting up a connection between the device and the bluetooth module (bluetooth pairing) , a message is sent to the bluetooth module using the Arduino Automation app. The app contains options to send the message as typed input or voice input. The option required is selected and then the bluetooth device to be connected, that is, HC-05 is connected. After the connection becomes successful, the message can be entered through the app.

At first, a default message is stored in the flash memory of Arduino UNO. Whenever a new message is received by the bluetooth module there occurs an interrupt in Arduino. If the received message is not equal to the old message it rewrites the message in the flash memory to the new message. Then, the message is sent to the 20x4 LCD display unit and the message is displayed on it according to the program we've created and uploaded into the arduino.

## 5.2 FLOWCHART

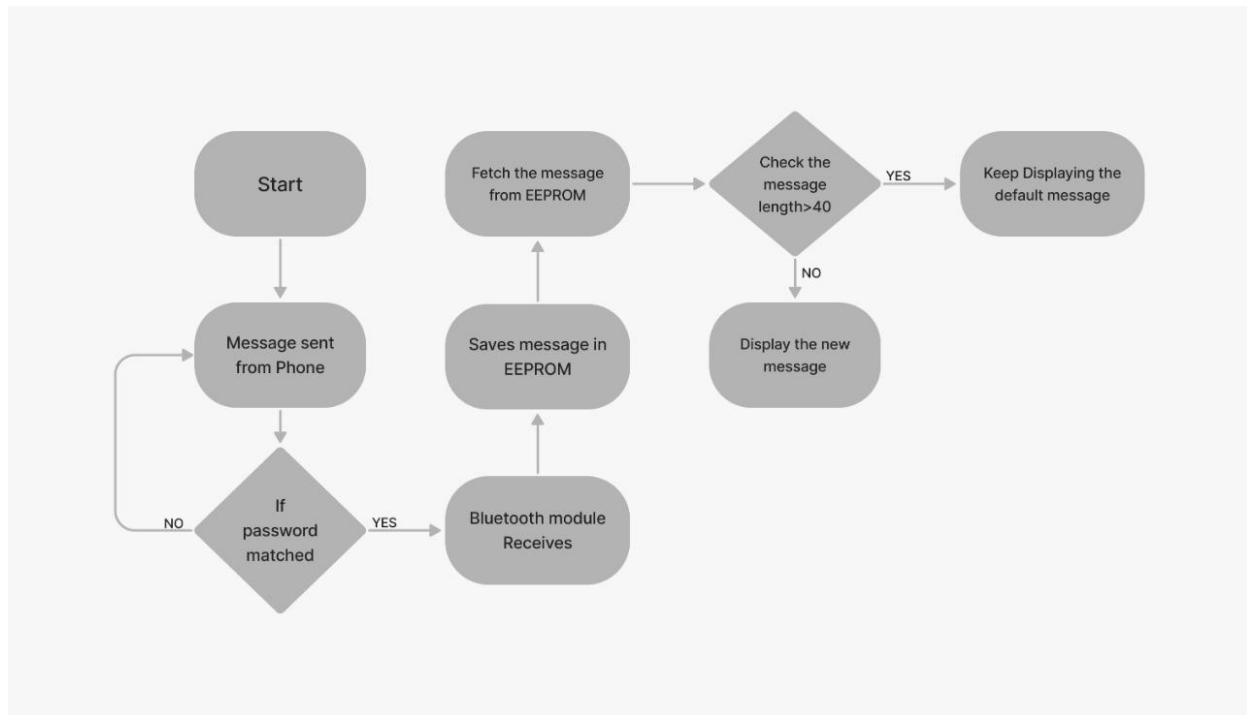


Fig 5.1: FlowChart for the proposed system

## 5.3 COMPONENTS REQUIRED

Components	Quantity (Nos.)
Arduino UNO	1
HC-05 Bluetooth Module	1
20x4 LCD Display	1
BreadBoard	1
Resistor : 1k	2
Jumper Wires(male to female)	20

## 5.4 CIRCUIT DIAGRAM

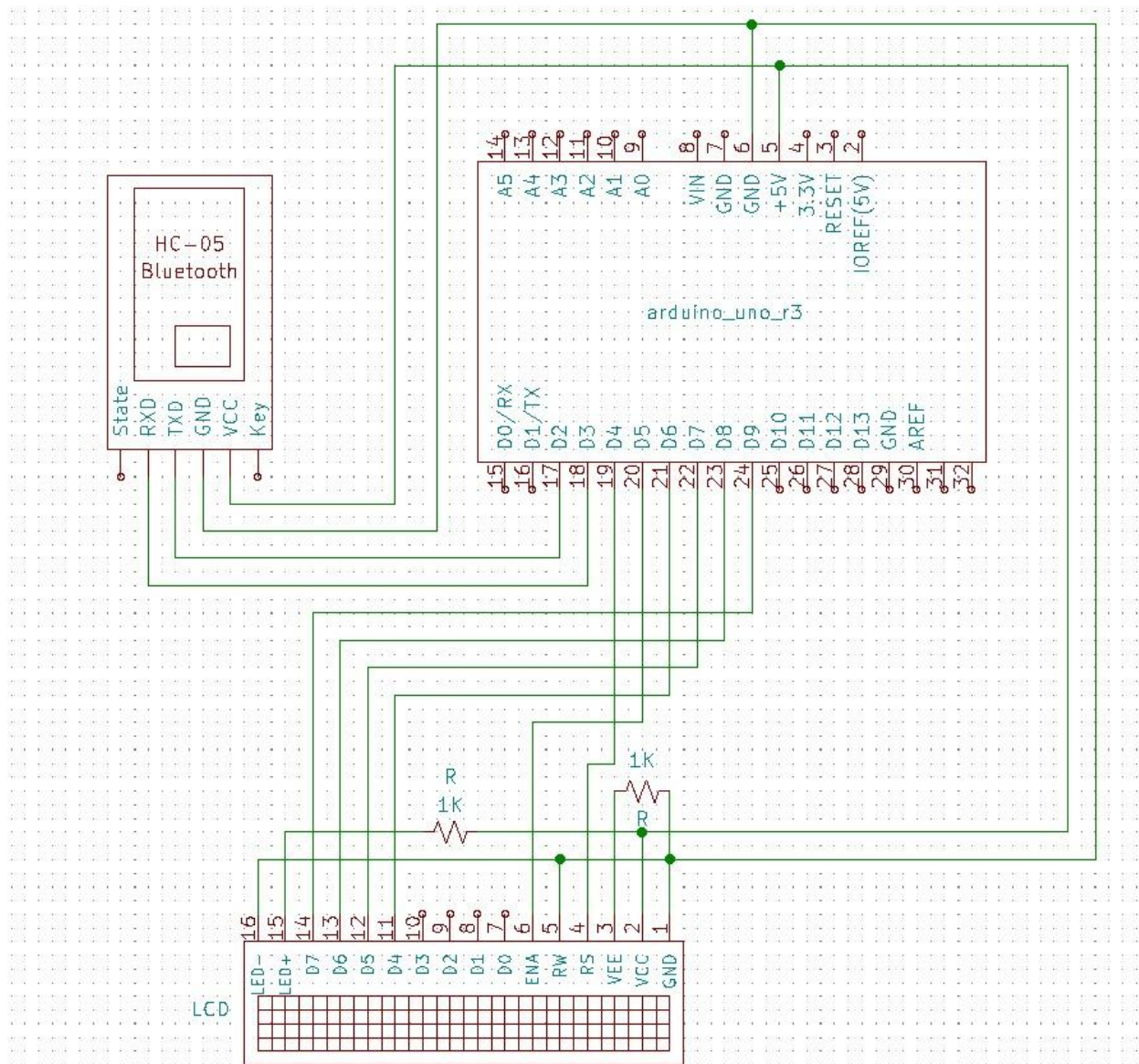


Fig 5.2 Circuit Diagram of the proposed system



## 5.5 PROGRAM

```
#include <LiquidCrystal.h>
```

```
#include <SoftwareSerial.h>
```

```
LiquidCrystal lcd (4, 5, 6, 7, 8, 9);
```

```
SoftwareSerial mySerial (2, 3); //(RX, TX);
```

```
String val = "Hello";
```

```
String oldval;
```

```
String newval ="Hello";
```

```
int i = 0;
```

```
int len=0;
```

```
void setup()
```

```
{
```

```
  lcd.begin(20,4);
```

```
  mySerial.begin(9600);
```

```
  //Serial.begin(9600);
```

```
  lcd.setCursor(0, 0);
```

```
  lcd.print("Wireless Display");
```

```
  lcd.setCursor(0, 1);
```

```
  lcd.print("Using Bluetooth");
```

```
  delay(3000);
```

```

    lcd.clear();

    lcd.print("Welcome!");
}

void loop()
{
    val = mySerial.readString();
    val.trim();
    Serial.println(val);
    if(val != oldval)
    {
        newval = val;
    }

    lcd.clear();

    len=newval.length();
    if (len>40){
        lcd.print("Out of Bounds");
    }
    else{
        lcd.setCursor(i, 0);
        lcd.print(newval);

        i++;
    }
}

```

```
if(i+len >= 20 )  
{  
    i = 0;  
}  
val = oldval;  
}  
}
```

## **CHAPTER 6**

### **RESULTS AND DISCUSSIONS**

The project “Wireless Display Using Bluetooth” consists of an Arduino UNO R3 Board, a bluetooth module HC-05 and a 20 x 4 HD44780 LCD Display. We have successfully developed a code using Arduino IDE and have used a bluetooth module HC-05 to receive and transmit the data to be displayed on the LCD. The messages can be sent using a phone as either text messages or as voice input. This can be done by first pairing the smartphone with the bluetooth module and then sending the messages using an automation app which can be easily downloaded from the app store. These messages are then displayed on a 20x4 LCD display. The Display board can easily be updated by sending the new message via the same app. The old messages will then be interrupted and replaced by the new message.

This is a very user friendly prototype since it can be easily accessed by anyone having a smartphone and an automation app installed in it. Anybody can easily connect with the wireless display by pairing it with the bluetooth module and can easily send the required information.

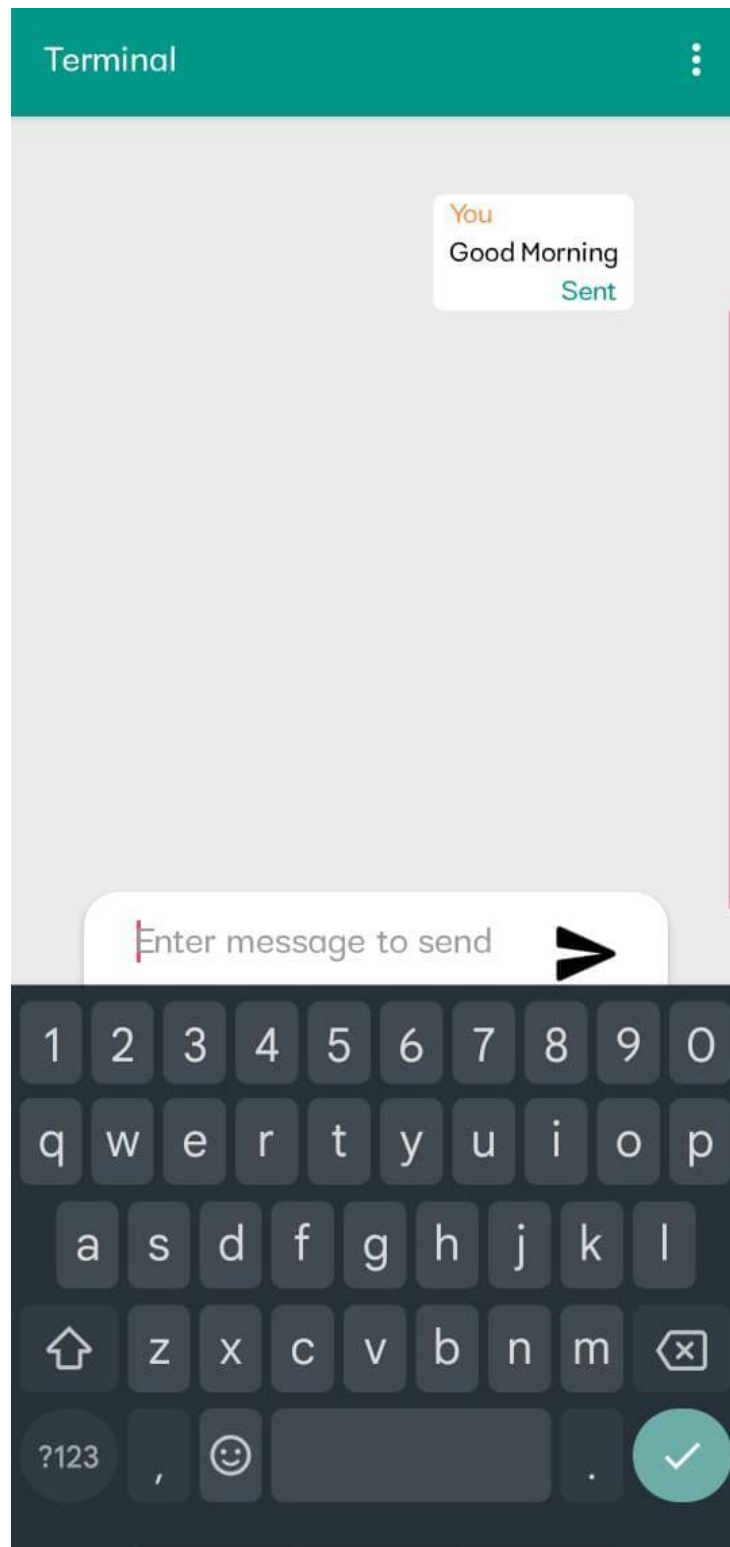


Fig 6.1: Text message sent through app



Fig 6.2 : Text Message Displayed on the LCD display

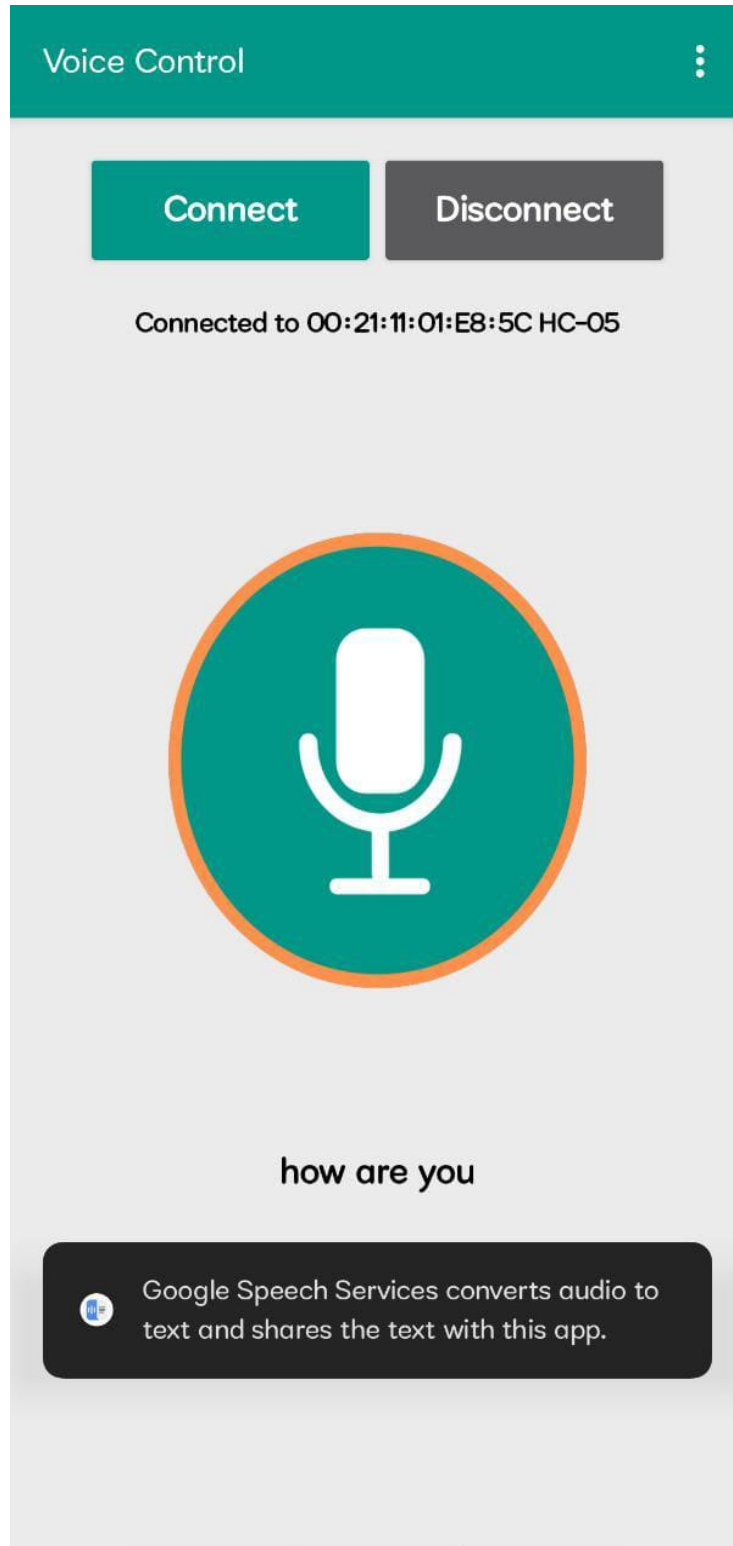


Fig 6.3 :Voice message sent using the app



Fig 6.4: Voice Message displayed on LCD as text



## **CHAPTER 7**

### **CONCLUSIONS**

Notices boards are the key objects to notify people about the information that we wish to convey and thereby this project does the work to implement the same. As our display board is digital and the information passed to it is through a smartphone, it merely requires much work from our side other than typing in the information through the app in our smartphone. So it eliminates the traditional way in which we have to either manually write the content on a board with our hands and rub it off or pin papers on to the board. Since it is displayed on a digital screen, it eliminates the usage of paper and pen and similar materials, thereby saving those materials and eliminating wastage of such materials. Our project is very much helpful in crowded places like hospitals, banks and restaurants where a token system is adopted. As the place is crowded, it will be difficult for people to hear the token number from the loudspeaker, so by digitalising and displaying the token number on a screen, it will be easy for people to see their token number. Being user friendly, long range and faster means of conveying information are major bolsters for this application. By using this proposed methodology we can enhance the security system and also make awareness of the emergency situations and avoid many dangers.

#### **7.1 Scope for further work**

The main aim of our project is to display various notices which we have achieved using the Bluetooth technology, but the bluetooth module HC-05 we have used here has a range of only 10m, so accessing the noticeboard and updating it from beyond this range is not possible. This problem can be solved by using the wireless fidelity system since it has a higher range.

This prototype can be further improved by using a bigger display which can display multiple pieces of information at the same time. For example a bigger display can be made to include features like date and time simultaneously along with the message.

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- [8] **Aliya Farooquie, Aishwarya sakhre, Balaji Bomade, Madhavi badole, Ashwini Ughade,** *"Design and Implementation of Wireless Notice Board Display based on Arduino and Bluetooth Technology"* .
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