ISSN (Online) 2395-2717

International Journal of Engineering Research in Electrical and Electronic Engineering (IJEREEE)
Vol 4, Issue 2, February 2018

Electronic Scrolling Display Using Arduino Board

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***Abstract*: -- The led Display System is aimed at the colleges and universities for displaying day-to-day information continuously or at regular intervals during the working hours. Being GSM-based system, it offers flexibility to display flash news or announcements faster than the programmable system. Keyboard-based display system can also be used at other public places like schools, hospitals, railway stations, gardens etc. without affecting the surrounding environment. The led display system mainly consists of a receiver and a display toolkit which can be programmed from an Arduino IDE platform. It receives the message, through serial port and displays the desired information after necessary code conversion. It can serve as an electronic notice board and display the important notices instantaneously thus avoiding the latency. Being modular design, the led display is easy to expand and allows the user to add more display units at any time and at any location in the campus depending on the requirement of the institute.**

I. INTRODUCTION

Now-a-days LED Message Scrolling Displays are becoming very popular .These displays are used in shopping malls, theatres , public transportation, traffic signs, highways signs, etc., The big problem with these displays is to carry a computer or special keyboard for generating and sending messages to LED moving display boards dynamically. Carrying a host computer or special keyboard every time to generate message for LED display boards is big headache and also increase cost if it go for wireless based message sending. To make the LED scrolling display more portable, a GSM mobile phone is used instead of carrying keyboard or a host computer for generating or sending messages to LED display board. A text message is typed in the GSM mobile phone and sent it by using SMS service of the mobile phone to LED moving display boards. A Arduino board is connected to the LED display hardware is used to receive the message and send it to the controller circuit of the LED display. Then the controller circuit of the LED display filters the message content in message and changes the display text in LED display dynamically. By using this arduino sketch it is possible to change the text in the LED display board from anywhere in the country. The idea implemented in this project reduces the total cost that is required in the traditional LED display boards not only it makes easier to send message to the LED display boards. The project uses a Arduino UNO board at the display side with atmel 328p micro controller to send text to drive the LED display board. Along with these a power supply unit and supporting hardware for microcontroller is used.

A dot matrix is a 2-dimensional patterned array, used to represent characters, symbols and image. Every type of modern technology uses dot matrices for display of information, including cell phones, televisions, and printers. They are used in textiles with sewing, knitting and weaving. A seven segment display is a form of electronic display device for displaying decimal numerals that is an alternative to the complex dot matrix displays.

The roll of a dice has decided the fate of kingdoms. The dice is the oldest device known to human beings for generating random numbers from 1 to 6.In this paper, we present an electronic device using an 8x8 dot-matrix LED display to simulate the faces of a real dice. Pressing a switch generates a random number on the display. A microcontroller is used to check the status of the switch and generate a random number. The dice number is displayed on the dot-matrix LED display with the help of an LED display driver.

Dot Matrix Display:

The dot matrix LED displays can be made with individual LEDs, or a pluggable unit can be bought. By making use of the premade pluggable unit, production costs can be lowered. Further, this type of display can show graphics and normal text. This enables the display to be used for more than just sporting events. It can be used as a billboard and information board in shopping malls. These units can be stacked or cascaded in such a manner that a larger display can be constructed. This is usually done in multiples of eight, making use of an eight bit microcontroller, as this enables easier driving. A 40-pixel by 56-pixel size is thus the smallest size of a LED panel that can be constructed when making use of a 5-pixel by 7-pixel LED dot matrix unit as shown in figure. 1. Each of these LED dot matrix display units can display a character or symbol, hence a total of 40 characters could be displayed at any given time. These characters will, however, be too small to be seen at long distances away from a LED dot matrix billboard. Hence pixel binning will have to be used. This is the process in which adjacent LEDs are grouped together to make larger pixels. By doing this the resolution of the LED dot matrix billboard will be lowered, but the size of each character will be larger and appear brighter.

• be visible in bad weather conditions

ISSN (Online) 2395-2717

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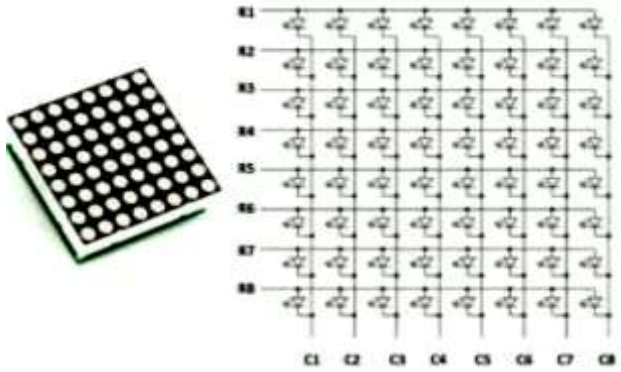
• have the highest possible refresh rate without compromising brightness

Brightness:
With all LEDs glowing, the brightness of the transmitter is dramatically enhanced. This makes the audio transmission more effective and immune to noise as the attenuation in the medium becomes negligibly small for line-of-sight (LOS) reception. In addition, the receiver's distance from the transmitter can be increased.

Figure 1

Power USB:
Arduino board can be powered by using the USB cable from your computer. All you need to do is connect the USB cable to the USB connection

Power (Barrel Jack):
Arduino boards can be powered directly from the AC mains power supply by connecting it to the Barrel Jack



The LED dot matrix display should :-

- be reconfigurable for indoor and outdoor applications
- be expandable by making use of extra LED dot matrix display panels
- be able to alter brightness automatically
- use modular design and
- be able to do pixel binning for lower resolution applications

Voltage Regulator:
The function of the voltage regulator is to control the voltage given to the Arduino board and stabilize the DC voltages used by the processor and other elements.

Crystal Oscillator:
The crystal oscillator helps Arduino in dealing with time issues. How does Arduino calculate time? The answer is, by using the crystal oscillator. The number printed on top of the Arduino crystal is 16.000H9H. It tells us that the frequency is 16,000,000 Hertz or 16 MHz.

Arduino Reset:
You can reset your Arduino board, i.e., start your program from the beginning. You can reset the UNO board in two ways. First, by using the reset button (17) on the board. Second, you can connect an external reset button to the Arduino pin labelled RESET (5).

Pins (3.3, 5, GND, Vin):
3.3V (6) − Supply 3.3 output volt
5V (7) − Supply 5 output volt
Most of the components used with Arduino board works fine with 3.3 volt and 5 volt.
GND (Ground) − There are several GND pins on the Arduino, any of which can be used to ground your circuit.
Vin (9) − This pin also can be used to power the Arduino board from an external power source, like AC mains power supply

Analog pins:
The Arduino UNO board has five analog input pins A0 through A5. These pins can read the signal from an analog sensor like the humidity sensor or temperature sensor and convert it into a digital value that can be read by the microprocessor.

Main microcontroller:
Each Arduino board has its own microcontroller (11). You can assume it as the brain of your board. The main IC (integrated circuit) on the Arduino is slightly different from board to board. The microcontrollers are usually of the ATMEL Company. You must know what IC your board has before loading up a new program from the Arduino IDE. This information is available on the top of the IC. For more details about the IC construction and functions, you can refer to the data sheet.

ICSP pin
Mostly, ICSP (12) is an AVR, a tiny programming header for the Arduino consisting of MOSI, MISO, SCK, RESET, VCC, and GND. It is often referred to as an SPI (Serial Peripheral

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Interface), which could be considered as an "expansion" of the output. Actually, you are slaving the output device to the master of the SPI bus.

Power LED indicator

This LED should light up when you plug your Arduino into a power source to indicate that your board is powered up correctly. If this light does not turn on, then there is something wrong with the connection.

TX and RX LEDs

On your board, you will find two labels: TX (transmit) and RX (receive). They appear in two places on the Arduino UNO board. First, at the digital pins 0 and 1, to indicate the pins responsible for serial communication. Second, the TX and RX led (13). The TX led flashes with different speed while sending the serial data. The speed of flashing depends on the baud rate used by the board. RX flashes during the receiving process.

Digital I/O

The Arduino UNO board has 14 digital I/O pins (15) (of which 6 provide PWM (Pulse Width Modulation) output. These pins can be configured to work as input digital pins to read logic values (0 or 1) or as digital output pins to drive different modules like LEDs, relays, etc. The pins labeled "~" can be used to generate PWM.

AREF:

AREF stands for Analog Reference. It is sometimes, used to set an external reference voltage (between 0 and 5 Volts) as the upper limit for the analog input pins.

Circuit Block Diagram:

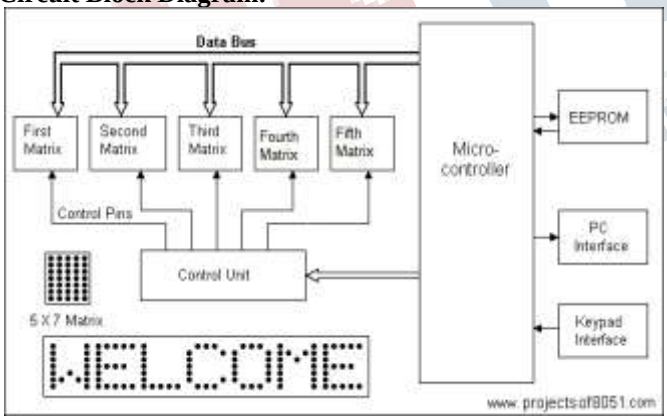


Figure 4

Program

Defining the pins

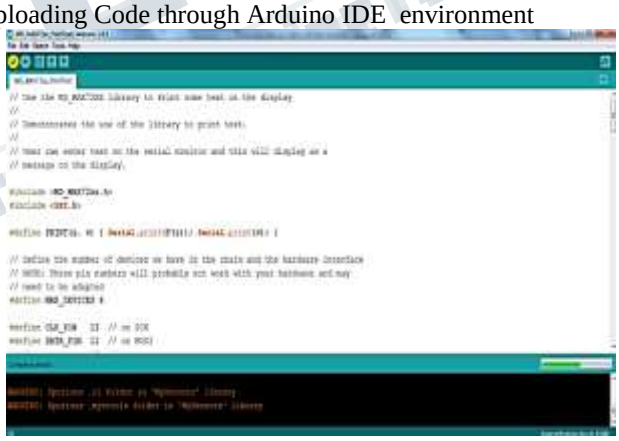
```
#define  MAX_DEVICES 8
#define  CLK_PIN                  13  // or SCK
#define  DATA_PIN        11  // or MOSI
#define  CS_PIN          10  // or SS
```

Reading serial data

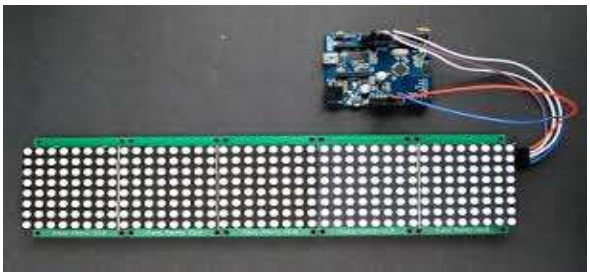
```
void readSerial(void)
{
  static uint8_t      putIndex = 0;

  while (Serial.available())
  {
    message[putIndex] = (char)Serial.read();
    if ((message[putIndex] == '\n') || (putIndex >= BUF_SIZE-3))        // end of message character or full buffer
    {
      // put in a message separator and end the string
      message[putIndex] = '\0';
      // restart the index for next filling spree and flag we have a message waiting
      putIndex = 0;
      newMessageAvailable = true;
    }
    else
      // Just save the next char in next location
      message[putIndex++];
  }
}
```

Uploading Code through Arduino IDE environment



II. RESULT



Single module display

ISSN (Online) 2395-2717

International Journal of Engineering Research in Electrical and Electronic Engineering (IJEREEE)
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Figure 5 array of modules displays connected in series

III. APPLICATION

A. Educational Institution and Organization: Currently we rely on putting up papers on notice boards to inform people of events. This method can be discarded by using GSM based LED display to display information in real time. E.g. Placement news, cultural activities news, etc.

B. Advertisement: In shopping malls we get to hear the offers on various products from time to time. Instead we continuously display the information regarding the products and related offers on electronic display boards.
C. Railway Station: Instead of announcing the delay in arrival of trains we can display the information.

D. Hotels: To display the availability of the rooms and the room rents the type of rooms**.**

E. Nursing homes: To display the staff attendance, the availability of the doctors, the list of the specialized doctors, no of in patients etc.

IV. MERITS

A. User friendly: Messages are only to be typed on a mobile or a computer, which in turn are displayed wirelessly on the display unit.

B. Eliminates use of printers: Since we don't use papers to display information, printers are also of no use in this system.
C. Faster means of transferring information: There is no delay in transmission of information. Messages are displayed in a matter of seconds after typing

D. Future Enhancement:
a. A commercial model can be able to display more than one message at a time.
b. In our system we are sending messages via GSM network and displaying on a LED by utilizing AT commands. The same principle can be applied to control electrical appliances at a distant location.
c. This technology could be further modified and more upgraded as per individual need and interest.
We have discussed some basic ideas of this technology. And depending on innovative applications user can upgrade as per requirement.

V. CONCLUSION

This model can be used very efficiently in establishments like chain restaurants wherein the order and special discounts can be displayed at all branches simultaneously, in colleges wherein students and staffs can be informed simultaneously in no time. It can be set up at public transport places like railways, bus station, and airport and also at roadside for traffic control and in emergency situations, it is cost efficient system and very easy to handle. Latency involved in using of papers in displaying of notices is avoided and the information can be updated by the authorized persons.

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