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Design and Simulation of a Display Board with Dot Matrix

Arpan Shringi, Kumari Shweta Sinha, Anubhav Ghumera, Ishita Bhargava, Deepalee Vijay

Electronics and Communication Engineering Department, Poornima Group of Institutions, Jaipur, India

ABSTRACT

Displaying information is an essential part in the public places be it schedule in airports or display in elevators. It will be a tedious task to be maintained by separate person is required to take care of this notices display. This project deals about an advance hi-tech display board that can be used in canteens to display the menu. The project is built around the AT89C51 micro controller from Atmel. A voice module is added to convey information easily and to make it user friendly.

Keywords : Display Board; AT89C51; Canteen; Menu; Voice Module

I. INTRODUCTION

The main objective of the project is display of canteen menu to the masses without much manual efforts. Changes in price of the items are not often, Thus we can achieve flexibility in notifications. The project provides us with easy and user friendly interface to display any message on the LED matrix. There is no need to manually write the message like in conventional display boards thus it is more popular. Moreover the DOT matrix display is more catchy and can be seen from a the research relating to the design of LED displays and microcontroller-based circuits was investigated throughout this paper. This knowledge provides better methods for approaching the task while helping to gain an understanding of microcontroller systems that will be useful for future works. The design for a Dot matrix display that can be mounted in the canteen is then implemented in this work in the initial prototype, to verify its physical viability and to investigate any possible improvements. From which a viable product can be developed in the future.

The Project is divided into the following parts:

a. A software interface to input the string to be displayed.
b. The microcontroller unit which will serially decode the data to the matrices. Using Atmel Microcontroller to input, store, and control and output the data for the message characters on a dot matrix.
c. Design and realizing the data display panel The LED matrix which will display the final output in the form of alphanumerical characters. The Atmel AT89C51 microcontroller is used for the main purpose of giving final output to the LED matrix. Use of LED provides many advantages like low cost, high brightness, low power consumption, ease of maintenance, easily available etc

Display Systems Design Procedure The initial step was the evaluation of the requirements that needed to be met. Also, the technical features, physical operation and possible applications for the design were addressed. Also, the functional specifications that outlined the purpose and features that the design would ultimately fulfill were also addressed. The main control circuit was initially tested on a breadboard because the microcontroller ports used for various tasks would ultimately change as the work developed and until the layout was finalized. Thus, the pin connections could easily be altered as required. The microcontroller requires very few external parts for typical operation The Atmel AVR family of controllers provides the engineer with cost effective solutions in designing low power control systems.

II. METHODS AND MATERIAL

Proposed Work

The initial step is to design the LED matrix which will display the menu. Next is the power supply to drive the LED matrix. After that the designing of the microcontroller unit is dome. The illuminated display consists of smaller modules (dot matrix units) arranged together to form a larger screen, each module usually consisting of a 5 x 7 matrix of LEDs. The goal of this paper is to create a display containing approximately 49 modules. The microcontroller coding for encoding the alphanumeric data into hex codes according to the dimensions of one character on the matrix, here (5x7) is done. Audio module assembly and, the software based user interface to input the message to be displayed and finally the design and fabrication of PCBs for the whole system is performed.

A. LED matrix and Power supply

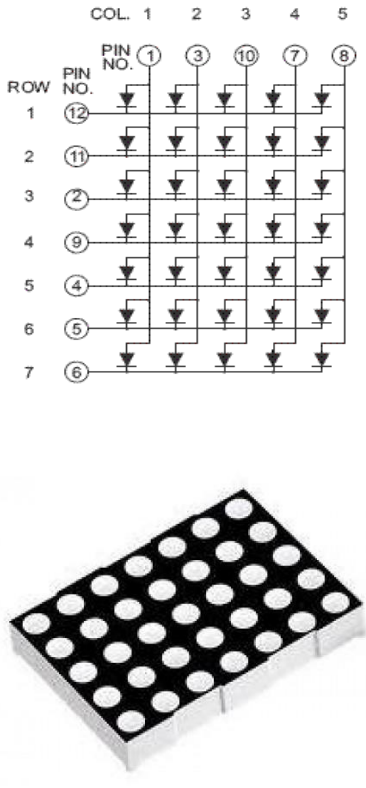


Figure 1. 5x7 Dot Matrix

The LED matrix designed is 5x7 per character matrix. The anodes of the rows are made common and their common terminal is given to the power supply and the cathodes of the columns are made common and provided the supply. The anodes in the rows and cathodes in the columns are made common so that it forms a logic wherein we can access a particular LED with controlled inputs from the microcontroller port. Each of the microcontrollers is interfaced with three 5x7 dot matrices. The columns are driven by PORT 3 and also pull up it attached to them to fulfill the current deficiency that leads to low intensity problem.

Display Scanning A commonly used method to control the illuminated displays is to turn the rows or columns of the display on and off in quick succession. A sub-unit of the displays, columns of LEDs, is connected to the common bus, which is controlled to output the required pattern for that sub-unit at each instant. The sub-units are then sequentially illuminated with the corresponding pattern. Repeatedly cycling through this process, called scanning is used to create the phenomena of visual persistence. The trick is to build one character on the display by scanning the columns very fast. Single color LEDs are primarily used when the exhibited information is principally simple text i.e., where no emphasis or highlighting is required. Single color LEDs were selected to be used in this work.

The Microcontroller Unit

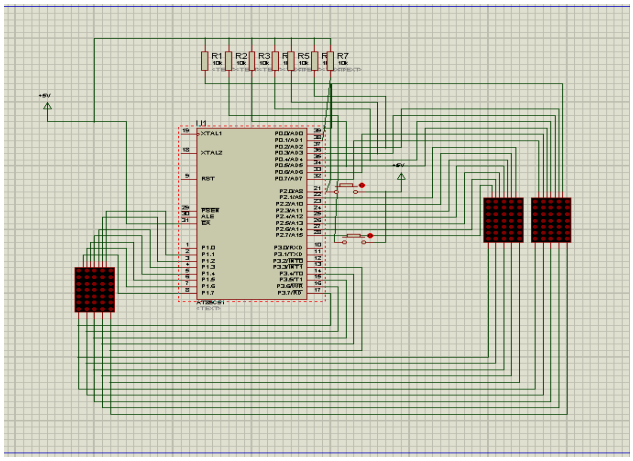


Figure 2. Proteus simulation of microcontroller circuit

The sample figure shows how the microcontroller unit is used to drive three small LED matrices. Port 1 of uC gives the output to the row of one dot matrix. The 8 pins of the port 3 are given to the cathodes of the LED matrix to drive one column element of the matrix at a time. The power consumption increases we have to add individual power supply to the matrix and drive it through the transistor array.

Character Coding

The Characters to be displayed on the matrix are first decoded in a particular format according to the dimensions of per character spacing on the matrix. Design Strategy was to select between two switching methods:

Row switching in which, the data is first loaded into the columns inputs serially with one data line. The enabling of the 7 rows of the display is carried row by row, i.e. only one raw is enabled and the others are OFF, then the next raw is enabled and the others are disabled and so on i.e., it goes into infinite loop. When this is carried out so fast, the message appears as it is ON all times since human eyes cannot follow the enabling and disabling processes. B.

In Column switching approach, on the other hand, one column is selected to be enabled and at the same time the data to be displayed is sent through the rows inputs and so on (for all rows).we used this approach in the development. The character codes to be accessed by the microcontroller are written in C language and converted to equivalent hex format with the help of KEIL uVision software. Each column of the LED is driven for a brief period before switching to the next column. Because of a visual phenomenon termed persistence of vision1, rapid switching between rows produces the illusion that all of the rows are ON at the same time.

To function as intended, the two additional requirements must be met are:

Given below are some of the codes of the alphanumeric data to be displayed on the LED matrix.

1. The LEDs must be overdriven proportionately or they can appear dim. The dimness occurs because a column is ON for only a fraction of time.

2. The columns must be updated often enough (for example, each column is scanned about 30–40 times per second), to avoid display flicker.

```
#include<reg51.h>
void delay(int a)
{int i,j;
for(i=0;i<=a;i++)
      for(j=0;j<1250;j++);
      }
void main()
      {
int
b[]={0xc0,0xf9,0xa4,0xb0,0x99,0x92,0x8
2,0xf8, 0x80,0x90};
          Int
z[]={0xc0,0xf9,0xa4,0xb0,0x99,0x92,0x8
2,0xf8, 0x80,0x90};
      int c,d;
      for(c=0;c<10;c++)
      {
       P1=b[c];
       delay(100);
       for(d=0;d<10;d++)
       {
        P3=z[d];
        delay(100);
        }
      }
}
```

Counters for Price Changing

The price of any item is prone to change often. So to ease the price changing process two push buttons have been provided and the change is done with the help of microcontrollers and programming of counters. The code to increase or decrease the price is as follows.

Audio Output

An audio output is attached to the display board to record a message and play it several times after a particular time delay repeatedly. As such conveying any message to the people present in the canteen becomes much easy.

III. RESULTS AND DISCUSSION

PCB Design and Fabrication

The simulation has been done on the Proteus software and coding has been done on KEIL uVision software .

The next designing of PCB layout is carried out by the use of CADSOFT EGALE software.

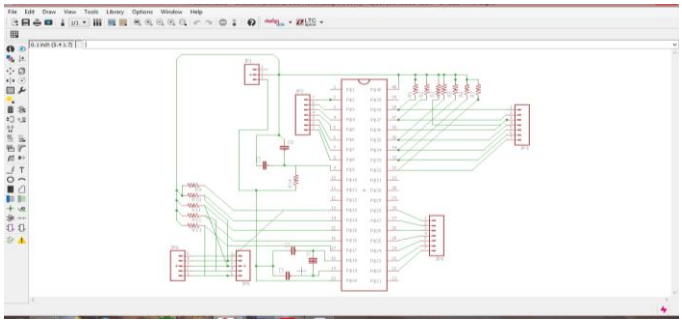
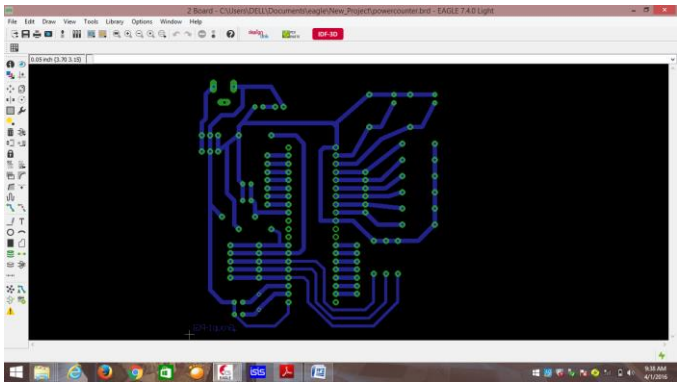


Figure 3. Eagle schematics for PCB design



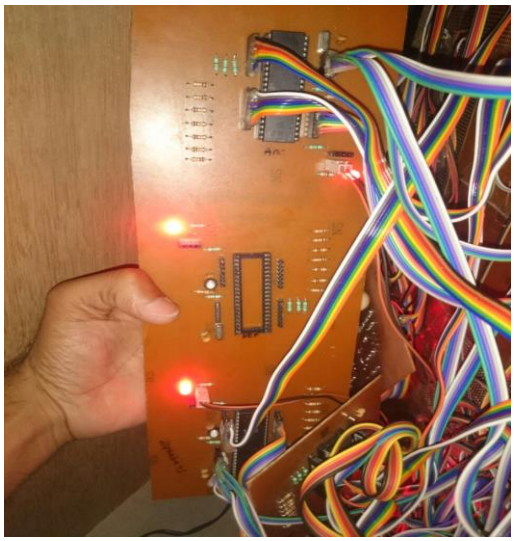


Figure 4. Final PCB layout

IV. CONCLUSION

The desired menu along with price was prepared and displayed through programming on dot matrix display board. Push buttons have been provided to increase and decrease the price of each item in the list with the help of counters. The set goals within this paper have been achieved, proving the feasibility of the display. The prototype was extremely developed economically using several stripboards on which the components were mounted. Through this type of construction, modifications could be easily made before entering into the development of larger scales, and more costly prototypes.

V. ACKNOWLEDGMENT

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