Department of Electrical & Computer Engineering (ECE)

Project Report

Course Title: Operating Systems Design

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Section: 3

Submitted to:

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Project Title: Text on 4x64 Dot Matrix Display through Arduino Nano

Abstract:

Technology breakthroughs have led to improvements in information presentation, marketing, and advertising techniques. Advertisements and notifications are displayed on dot matrix display boards.These notice boards are now a standard feature in educational institutions, retail establishments, and other public locations for displaying information about public transportation schedules, platform numbers, numerous product advertising, and many other relevant messages.

Introduction:

A display board made up of four 8 x 8 Dot Matrix displays placed in series may print characters using individual LEDs or a group of LEDs. This is known as a "4 in 1 dot LED matrix display module." Its low cost, widespread availability, and simple microcontroller interface are some of its other most intriguing features. The LEDs are arranged in this display's 32 columns and 8 rows. Therefore, it has a total of 32 x 8, or 256 LEDs. A MAX7219 common-cathode display driver IC with serial input and parallel output is present in each 8 by 8 LED matrix. Thus, there are four MAX7219 display driver ICs in the display module. This makes utilizing a microcontroller and microprocessor to operate the display easy. The smallest and most traditional breadboard-friendly design board for Arduino is called the Nano. The Arduino Nano has a Mini-B USB connection and pin headers that make it simple to link it to a breadboard. Dot-matrix displays are inexpensive electrical digital display devices that show data on devices like watches, calculators, clocks, and many more items that need a basic alphanumeric (and/or graphic) display device with low resolution.

Objectives:

The main objective of our project is to display any text or number in the 4 in 1 dot matrix display. The task is really simple. Students in high school or college may easily complete this sort of project. It is a relatively inexpensive craft, and just a few materials are required to complete it. This project's hardware component is fairly simple to construct. Online instructions for this project are also available. The coding, or software, portion is a little challenging because numerous different functions and loops must be created. If any of the loops or functions fail to run, nothing is shown on the screen.

Rationale:

This project appeals to us since it is simple and straightforward. It has no negative effects on the environment. Students frequently utilize these dot matrix displays with Arduinos for their projects for elementary school or college. Advantages of choosing this project displays are:

(i) how simple it is to upload and build code using Arduino.

(ii) The message may be updated and displayed dynamically to the audience.

(iii) The project just needs a small number of components.

(iv)This project is robust, and it requires essentially little upkeep.

(v) It is less expensive than similar ventures.

Background studies:

We did a lot of research before commencing this project. We spent a lot of time on Google looking into projects linked to Arduino. After that, we learn that the project is very simple. We learn about this project's instruction as well. This instruction greatly aids in our comprehension of the project. How the Arduino functions, the display functions, etc. We constructed our project as directed by those guidelines. Then, we might choose the tasks that would be the simplest for us to carry out. After that, everyone in the group sat down and discussed how to begin our working process.

Beginning on day one, we set out to complete some work each day. Online, we purchased the essential project components, and we then got to work. Finally, we were able to accomplish our objective by combining an Arduino Nano with a dot matrix display.

Required Components:

We needed a variety of components to accomplish this project. As follows:

(i)   Arduino Nano

(ii)   8*8 MAX 7219 Dot Matrix Display (4 pieces)

(iii)   5 line Jumper wires or connecting wires

(iv)   USB cable

(v)   Laptop

Working Procedure:

Our first objective was to acquire the components. We gathered information about each element we set up for our project from Google. Then we placed an internet purchase for the required parts (dot matrix display, Arduino Uno, jumper wire, etc.). We then started writing code. The laptop was connected to the apparatus. The code was then assembled using the Arduino IDE 1.8.19.The code was then used to program the Arduino Nano. Next, a USB cable will be used to connect the Arduino module to the PC. As a consequence, we moved on to the connecting phase. In our display area, each module has 64 pieces of LEDs. As a connection, we utilized 5 line jumper wire. The jumper wire was then attached to the dot matrix display after that. once more on the opposite end of the connected wire. Last but not least, we observed that the data we supplied into the code started to show up on the dot matrix display. This is how we attained the desired result.

Four 8 * 8 common dot matrices are used to construct these matrix display modules. Each LED matrix has 8 rows of LEDs and 8 columns of LEDs, for a total of 88 = 64 LEDs in each matrix. The LED cathodes are linked across columns and the LED anodes are connected across rows (8

pins) in this matrix (8 pins each). As a result, each display has a total of 16 pins that are used to manage the LEDs. Consequently, the 32 columns and 8 rows of LEDs in the 4 in 1 dot matrix display module will make up the display. As a result, it has a total of $32 \times 8 = 256$ LED numerals, making it larger and more character-filled.

For connection between Jumper wire and Dot matrix Display, Red cable connected with VCC, Orange cable connected with Ground Pin(GND),Yellow cable connected with Data In pin, Green cable connected with Chip Selection Pin (CS),Brown cable connected with Clock Pin (CLK). Again on the other side of connecting cable, we will connect -Red cable connected to 5 Volt, Orange cable connected to Ground Pin, Brown/Clock Pin connected to 13 no pin, Data pin connected to 11 no pin, CS pin connected to 10 no pin. Then we connected the Arduino module with the PC by using a USB port. . Finally, our hardware section work was finished.

We then started writing code. We have to make a lot of changes to the code because the hardware component depends entirely on it. If we didn't write the code correctly, the Arduino won't build it and the display won't be active. We provide the code for scrolling effects, alignment, dead-band speed, scrolling, pausing, display massage, etc. in the code. These are the features that our display massage relied on. Our display will be blank and no warning will appear if any of the functions failed to operate correctly. We create a "scrolling" function, which controlling the display massage's direction—from right to left or left to right—requires work. Next, we create a loop for the curmassage and new-massage functions. The welcome massage, known as Cur-massage, will only be displayed once on the display while the new massage will be repeated until it is proven untrue. Another piece of code is then created to manage the scrolling speed, which determines how quickly or slowly the display massage moves when it displays information or a massage. We create a piece of code for the pause function that controls how long the scrolling will stop and the new content will be displayed. message appeared on the screen for a brief moment. Additionally, we create the code for dead-band alignment, effect, and speed. We can also adjust the scrolling so that it only displays a particular message or piece of information at a time. When we are done writing our code, we upload it to the Arduino nano using a USB cable. We then discover that the Arduino nano has already compiled and programmed our code. After some time, we saw that the new

massage we added into the code and the cur-massage both correctly displayed on the dot matrix display. Finally, we have completed all of our work and the project is ready.

Conclusion:

Such a project is highly beneficial to our day-to-day lives. Because we can just type the information or message in the code and upload it to the Arduino, which will then show it to the audience, we don't need to worry about how to convey it to them. It helps us save time and effort. It doesn't impact the environment in any negative way. Using this dot matrix display and an Arduino, we may create a wide range of fascinating projects, including:

- Color-Changing Coffee Table

- Nano Automated plant Watering system

- Motion Activated Light

- Sensor Controlled Guard Lights Arduino Nano Security System

References:

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(ii)   https://www.makerguides.com/max7219-led-dot-matrix-display-arduino-tutorial/

(iii)   https://create.arduino.cc/projecthub/mdraber/controlling-8x8-dot-matrix-with-max7219-and-arduino-7314a7

(iv)   https://www.electroduino.com/max7219-4-in-1-led-dot-matrix-display-module-functions/

(v)   https://www.lumex.com/led-displays-dotmatrix.html#:~:text=The%20concept%20of%20LED%20Dot,or%205%20x%208%20pixels.

(vi)   https://www.youtube.com/watch?v=_b7AJZS2rsY