

PROJECT REPORT

DOCUMENTATION

PROJECT TITLE: 8X8X8 3D LED CUBE

TEAM MEMBERS:

Kanani Alishkumar Hareshkumar (B17EE037) [Also as Mentor]

Akash Jain(B18EE002)

Katariya Nirmal Ashvinbhai (B18CSE022)

Manan Chhajer (B18CSE029)

Ashish Ledalla (B18EE008)

BASIC AIM :

To Create an 8x8x8 Led Cube which is capable of showing pre-defined animations.

Reference Link:

<https://www.youtube.com/watch?v=pxLvK3Zn8jo&t=0s&index=9&list=PLfIO04HSTMCBaQuXKh7wDN4cEMHfADSvv>

Theory:

A LED cube is like a LED screen, but it is special as it has 3D. We can think it as of low-resolution displays.

In normal displays, it is normal to stack pixels closer to each other in order for better resolution but the LED cube has its limits.

Working:

The LED cube has 512 LEDs. So it is impractical to dedicate an IO port for each LED. Instead of an LED cube rely on an optical phenomenon called Persistence of vision. If you flash a LED really fast it will remain in your retina for some time even after LED is switched off. By flashing each layer of cube very fast after one another it gives the feeling of 3D.

With this setup, we will need only 64(anode) + 8(layers) IO ports to control each led.

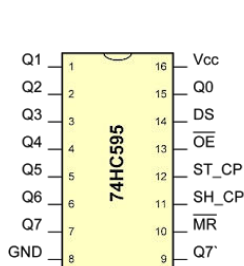
Anatomy of LED cube:

LED has two legs one positive and one negative. The positive end is connected to the pillars of the LED cube which acts as an anode. The negative one is connected to the layer.

Hence, to switch on a particular LED we have to give current to the corresponding pillar and ground the layer. So, we are able to control each and every LED.

IO Port requirements:

For an 8x8x8 LED CUBE we need 72 IO pins (64 IO pins of Anode Vertical Rows and 8 IO pins of Cathode Horizontal Layers). To have Control on each pin we used 9-Shift Registers 74HC595, 16-Transistors 2N2222A and interfaced it with Arduino.



74HC595 8-Bit Shift Register Pinouts

Pin	Symbol	Description
1	Q1	Parallel data output (bit-1)
2	Q2	Parallel data output (bit-2)
3	Q3	Parallel data output (bit-3)
4	Q4	Parallel data output (bit-4)
5	Q5	Parallel data output (bit-5)
6	Q6	Parallel data output (bit-6)
7	Q7	Parallel data output (bit-7)
8	GND	Ground (0 V)
9	Q7'	Serial Data Output
10	MR	Master Reset (Active Low)
11	SH_CP	Shift Register Clock Input
12	ST_CP	Storage Register Clock Input
13	OE	Output Enable (Active Low)
14	DS	Serial Data Input
15	Q0	Parallel data output (bit-8)
16	Vcc	Positive Supply Voltage



Power Supply:

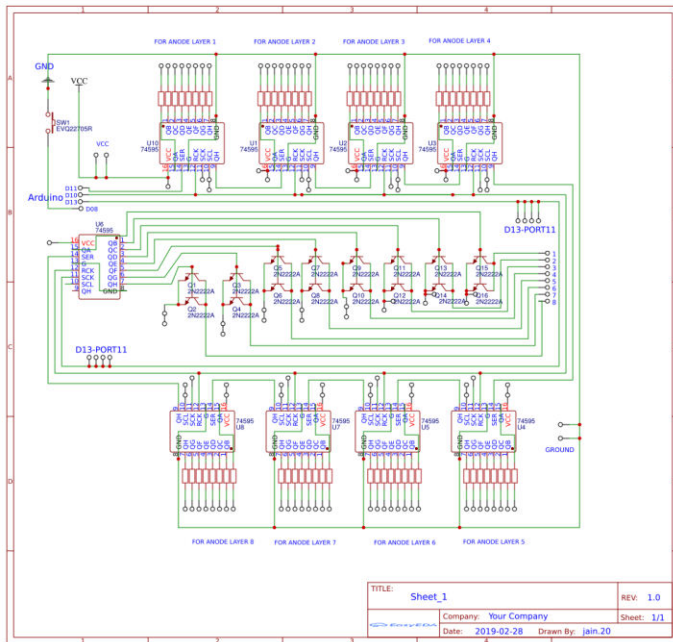
It is an important step as we need to keep Ground of Arduino and all Cathode layers same and, we need to supply power to Cube in such a way to fulfil its Current requirements since if we give power directly from Arduino, it's not enough to glow all LEDs.

CIRCUIT:

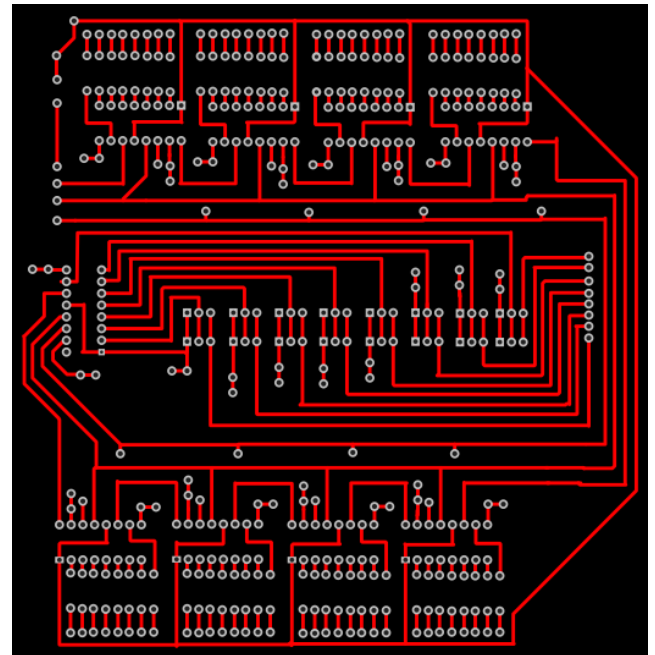
We have used 9-Shift Registers 74HC595. The first 8-Shift Registers are for the pillars (anode). The 8 IO pins of a Shift Registers are connected to a base of NPN transistor. The emitter is connected to pillar and collector is given 5V. The 8 IO pins of Shift Registers for layers (cathode) is also connected to a base of NPN transistor but here the collector is connected to the layers and emitter is grounded.

The 3 pins of each Shift Registers will be connected to the ARDUINO UNO. These three pins will decide what value to be assigned to the IO pins.

We have Designed the circuit on PCB and used SELF-MADE PCB.



Schematic Diagram of Circuit



PCB Diagram of Circuit

LINK OF DESIGN:

<https://easyeda.com/8-8-8/cube888>

<https://easyeda.com/editor#id=|e9a73856cd3f441cb986b7d06e219e26|77b3187a1f3b42058d080008932a8e72>

Code:

The software used for coding programs for the cube is Arduino.

Future improvisations:

We want to interface our 8x8x8 LED CUBE with MATLAB to create more advanced

animations like the audio visualizer (<https://www.youtube.com/watch?v=YCd7amvYW6c> and <https://www.youtube.com/watch?v=foRE-yohex8>) .

LINK of Pictures and Videos of OUR WORK:

<https://drive.google.com/open?id=1pZnSLLnDaP3aMubIACGet6KTbIPrOLuc>

A word of thanks:

We would like to thanks the Captain of Electronics Club Alish Kanani give us an opportunity to make this project, and without him this project was impossible.

LEARNING:

At last, it is always fun in learning something new. We learned many things about electronics circuits, PCB designing, PCB making, Soldering, working of Arduino and some programming of Arduino which may help us in future.



CUBE WHILE TESTING