10x10 LED Matrix Construction Guide

Intro

I have written this guide for those who wish to know how to understand the process that went into making the matrix I made. I didn't always use the best practices or materials when constructing it, so review the notes section of this document for my suggestions on how I would improve this project if I were to rebuild it.

This project was submitted to UNSW ELSOC's Hardware Flex 2021 S2 competition. I also did a small write up on LinkedIn and the code is hosted on GitHub.

Materials

- 1200 x 810 x 3mm Premium BC Plywood
- 1200 x 396 x 12mm Premium BC Radiata Plywood
- 610 x 405 x 3mm Opal White Acrylic
- 5mm A2 Black Foam Board
- Arduino Nano
- DFRobot LIS2DH Triple Axis Accelerometer
- 2.1mm DC Jack Terminal Block
- 5V 6A AC/DC Power Supply
- WS2812B RGB LED Strip – 5V, 30 LED/m, 4m
- ~5m total of insulated 14 AWG wire
- Solder
- PVA Wood Glue
- Screws
- Washers
- Double Sided Tape

Construction Method

LED Board

1. Cut LED board to size using rip saw
2. Measure and drill holes as marked for wires
    a. File out if necessary
3. Mark out locations of dividers as per drawing

Side Panels

4. Cut 12mm plywood to form 4x 45x396mm wide lengths
5. Make 2x 3mm routed slot along entire length
6. Cut into 2x 340mm and 2x 360mm lengths
7. Drill and file hole on one 360mm side panel

Back Panel

8. Cut back panel to size with rip saw

Electrical

9. Cut LED strips into lengths of 10 LEDs
10. Cut 9 lengths of wire to ~360mm and strip back the ends
    a. These will form the signal wires
11. Cut 2 lengths of wire to 340mm and strip back insulation every 33.3mm, leaving ~10mm wire exposed
    a. These will form the power rails
12. Cut 20x lengths of wire to 70mm and strip back the ends
    a. These will form the wires between power rails and LED strips
13. Lay LED strips on LED board horizontally, with each LED in a strip centred in its cell
14. Connect signal out of each strip to the signal in of the next strip, by passing the wire through the holes on the ends of the LED board
15. Connect the positive and ground power rails to their respective 5V and GND connections on the LED strips by passing the wire through the end holes as well
16. Attach DC jack to end of power rails
17. Connect wire from Arduino GND to ground power rail
18. Connect wire from Arduino 5V to power rail
19. Connect accelerometer to Arduino as per pin diagram

Foam Dividers

20. Cut 81 foam dividers to size using box cutter

Acrylic

21. Cut acrylic to size using jigsaw

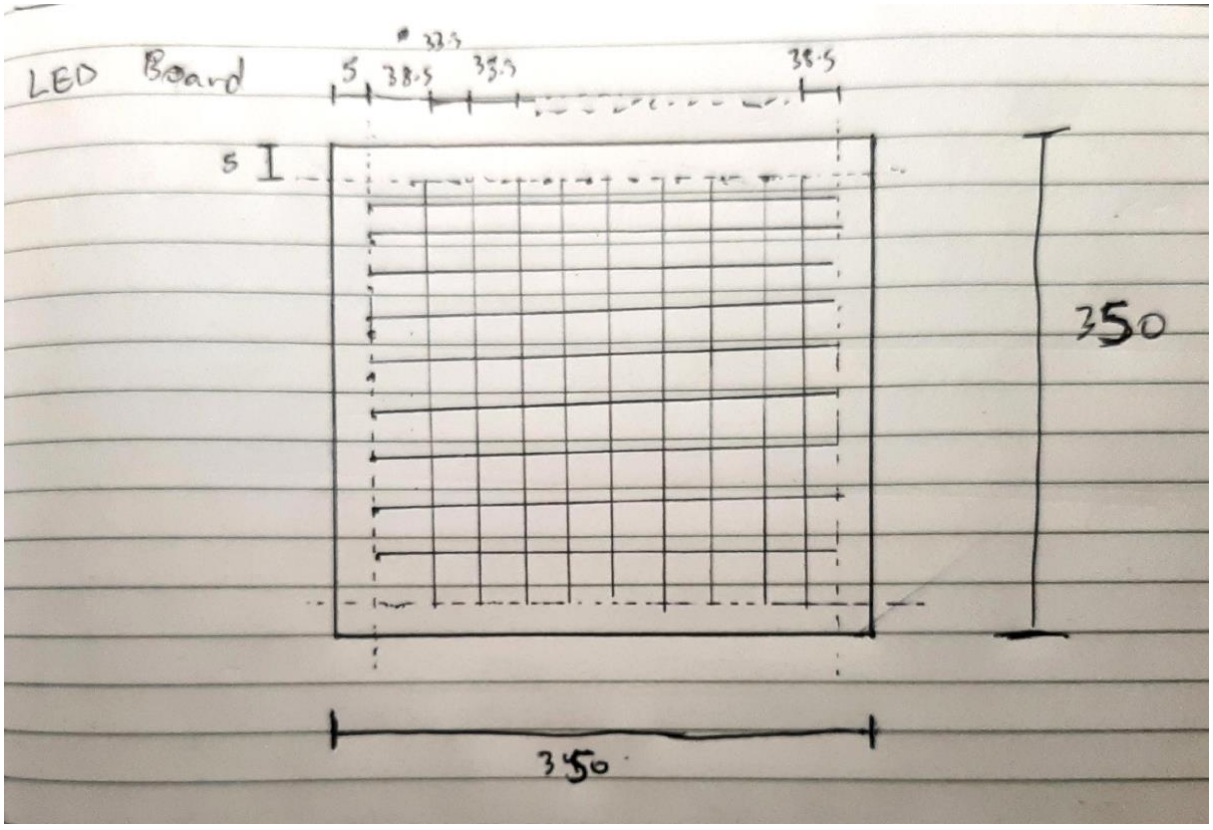
Assembly

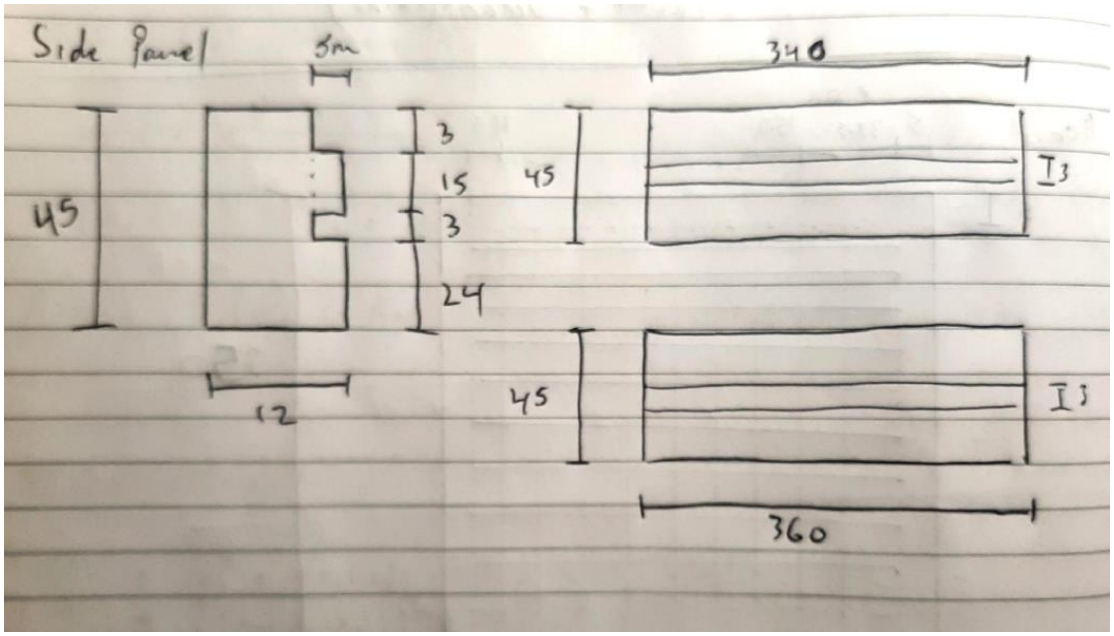
22. Hammer in LED board into side panel routed slots
    a. The DC jack panel should be closest to where the DC jack is
    b. Apply wood glue on joins

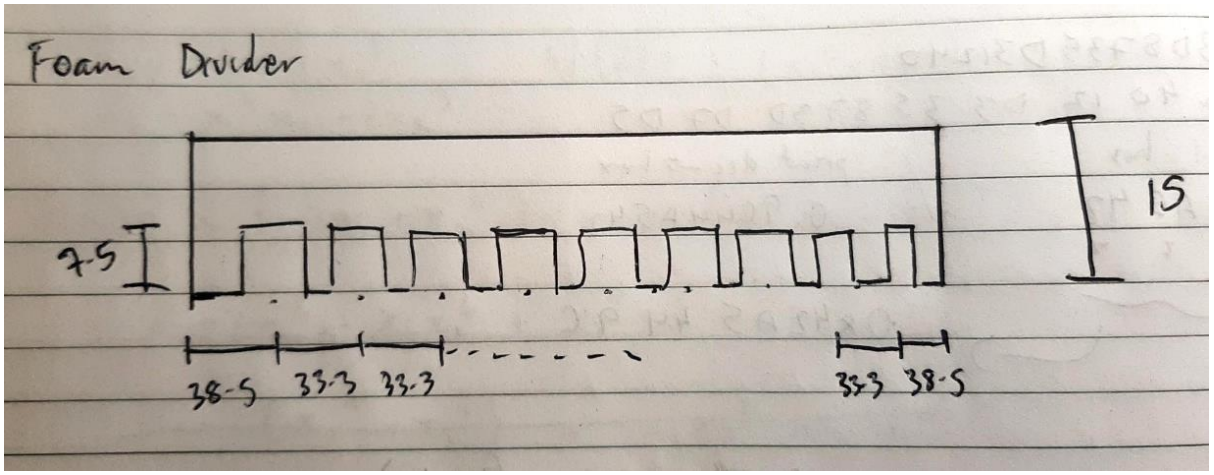
23. Remove adhesive pads from backs of LEDs stick down
24. Zip tie signal wires into bundles
25. Secure accelerometer with double sided tape to underside of LED board
26. Drill holes on back panel as per drawing
27. Place acrylic in rebate and drill holes as per drawing
28. Secure back panel with screws
29. Secure acrylic with screws and washers

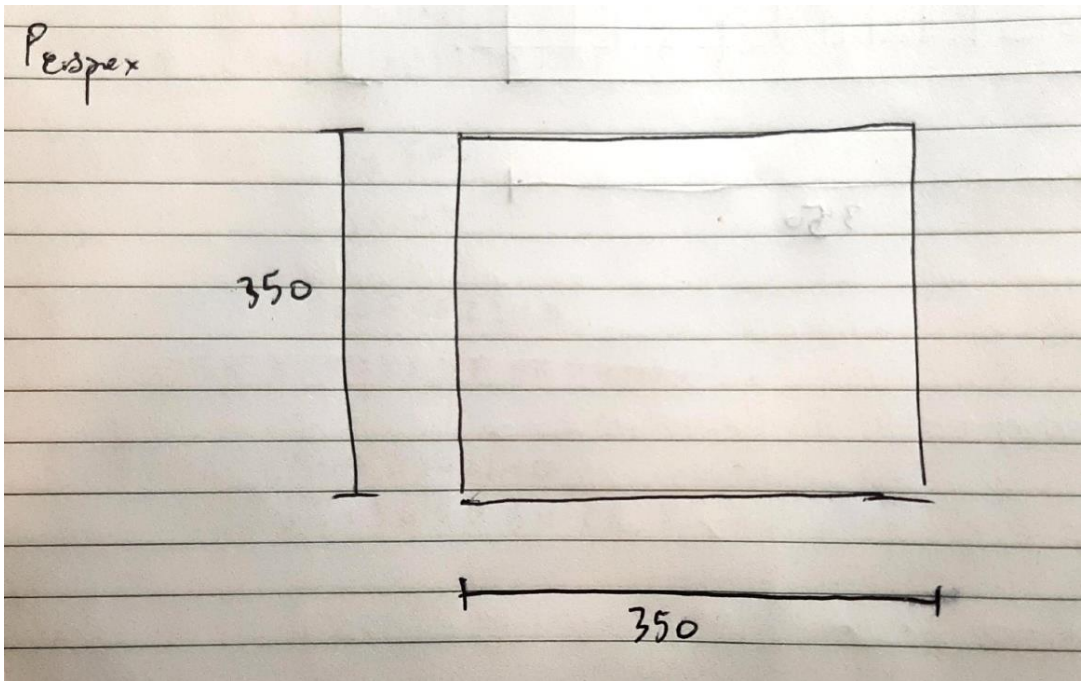
Drawings/Diagrams

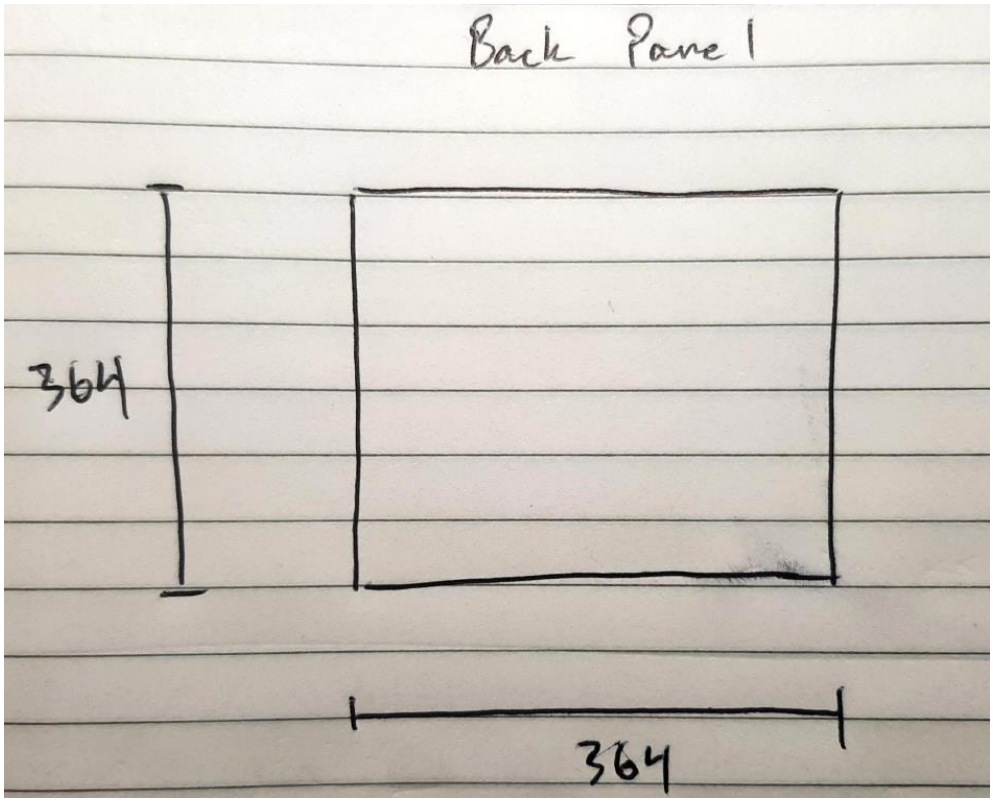
These aren't proper technical drawings, and some measurements may have changed as I discovered things may not have worked. These are more of a guide to get a feeling for the relative scale between pieces.

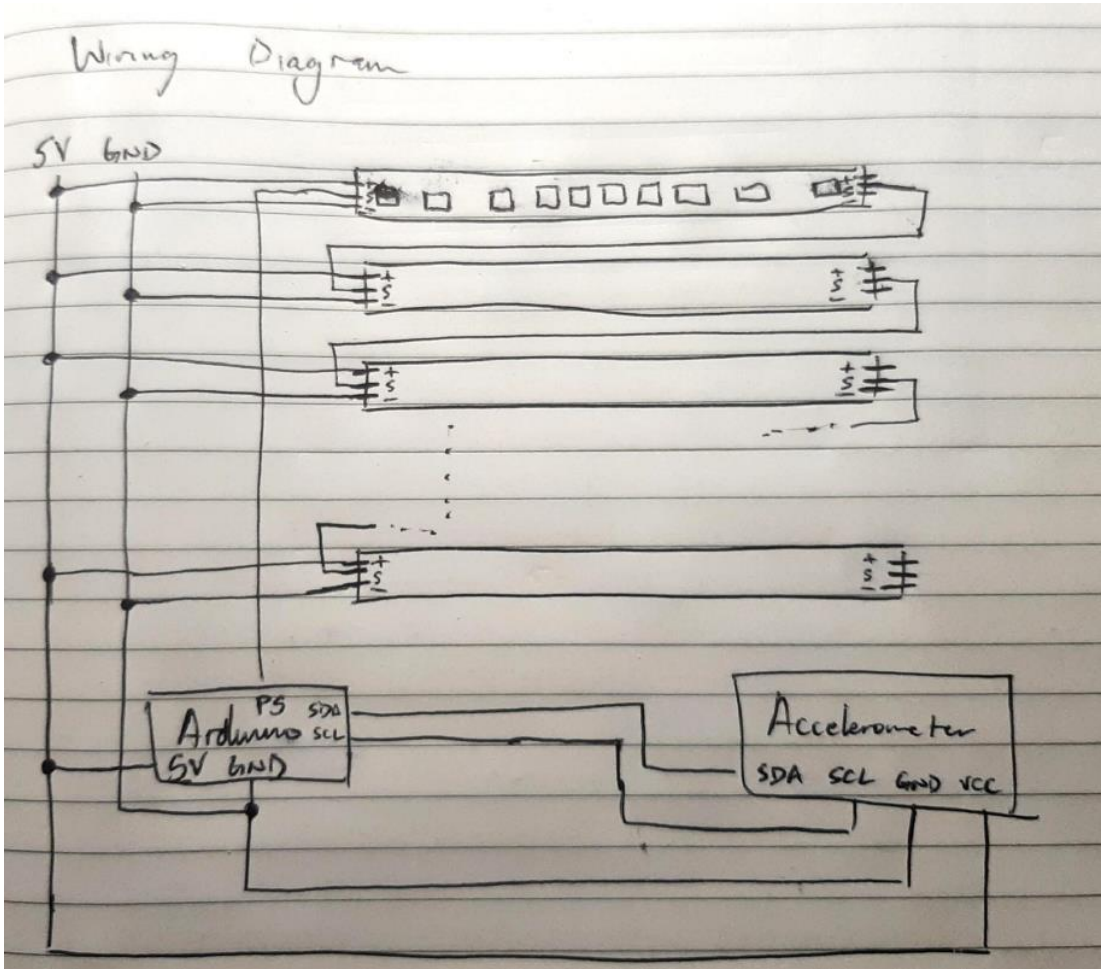



Side Panel
5mm
340
45
3
15
3
24
45
13
45
12
13
360


Foam Divider
15
7.5
38.5
33.3
33.3
33.3
38.5


Perspex
350
350


Back Panel
364
364


Wiring Diagram
5V GND
P5 SDA
Arduino SCL
5V GND
Accelerometer
SDA SCL GND VCC

Notes

1. When I made this project myself, I already had some supplies at home and used these instead of purchasing new material. Suitable substitutes have been selected for the materials list.
2. If I had splices and crimps available, I would have used those on the power rails instead of removing insulation at each section. Would have been much easier and safer
3. A lot of the project was guess work, including the lengths of the wires. If I re-did it, I would actually measure the wires to length
4. Adding a rebate for the acrylic to sit in wasn't worth it. In the end, having more surface area for the screws to grab in was more valuable then the recessed surface look
5. This is all powered by an Arduino, which is just hanging inside the matrix. If I was making more or wanted a cleaner look, I would design a PCB for it and the accelerometer
6. A lot of soldered joints popped off the LED solder pads because they formed corners too sharp as they were bent around the LED board. If redoing the project, I would allow more wiggle room for the connections to ease stresses on the solder pads.