

Link to drive folder containing videos and images:

<https://drive.google.com/drive/folders/1Ddie0zOqZ96OweZ55XNvvUQQ28ORcqM4?usp=sharing>

TIMELINE

Week	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Class Date	17 Jan	24 Jan	31 Jan	7 Feb	14 Feb	21 Feb	28 Feb	6 Mar	13 Mar	20 Mar	27 Mar	3 Apr	10 Apr	17 Apr	24 Apr
Phase	Prep			Prototyping					Project development						Showcasing
Activities	Intro to project theme, media and core methodology Team up Develop ideas	Team up Develop ideas	Present ideas Finalize team structure	Select one idea per team	Making prototype Presenting progress in class			Prototype demos Assemble bulk tech order list for project development	Developing projects Documenting progress at OSS Ordering additional components Presenting progress in class						Project showcasing

Week 1 - 4 (17 Jan - 7 Feb)

After presenting our ideas to the class and discussing with Prof Grba, we selected "Obsession with Winning" as our idea. During our consultation with Prof Grba and Bryan, they also suggested adding an extra element so that the focus would be more on the winning/losing.

Week 5 (14 Feb)

We planned out our timeline and split the workload for us to kickstart the project. We wrote the basic code for the interaction between the light bulbs and the switches, came up with a mechanism to release the loser and winner messages, and the mechanism for the coin slot.

(Research for coin slot mechanism:

<https://www.youtube.com/watch?v=S6hcN9y5MBI>

<https://www.youtube.com/watch?v=3dLXiffVGOQ>

<https://www.youtube.com/watch?v=S6hcN9y5MBI&t=247s>

<https://www.youtube.com/watch?v=IT7HVme9Hmg>

https://www.youtube.com/watch?v=RP_ADPMHKFs

Reflective Optical Sensor, maybe replaced by a vibration sensor? Or light sensor? Or

<https://www.youtube.com/watch?v=7ILHtAPY29I> Coin sorting cardboard)

We also researched how a relay mechanism would work with Arduino. However, in the end, we did not use the relay method because we realised we don't have transformers and would not be able to power up 25 light bulbs. The cost of the light bulbs would be too much because we needed quite an amount, and with light bulbs, we would also need to spend even more on light bulb stands and get bigger switches to complement the bulbs. The overall costs of using light bulbs were too great and hence we decided against it because it was not necessary to bring our concept across.

Basic code for light bulbs and switches:

```
File Edit Serial Tools Help
Arduino IDE v1.8.19

#include <Adafruit_NeoPixel.h>
#include <Servo.h>

const int LEDPIN = 12;
const int NUMLEDS = 25;
const int CHOSENONE = 0; //Random Point One
const int SWITCHONE = 0; //Random Point Two
const int IS = 0; //Pins Number
Servo myservo;

Adafruit_NeoPixel ledstrip = Adafruit_NeoPixel(NUMLEDS, LEDPIN, NEO_GRB + NEO_K888);

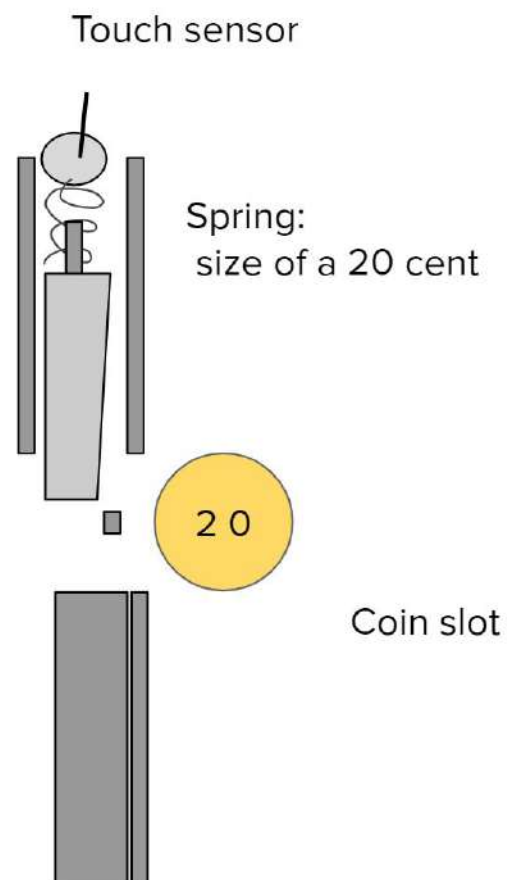
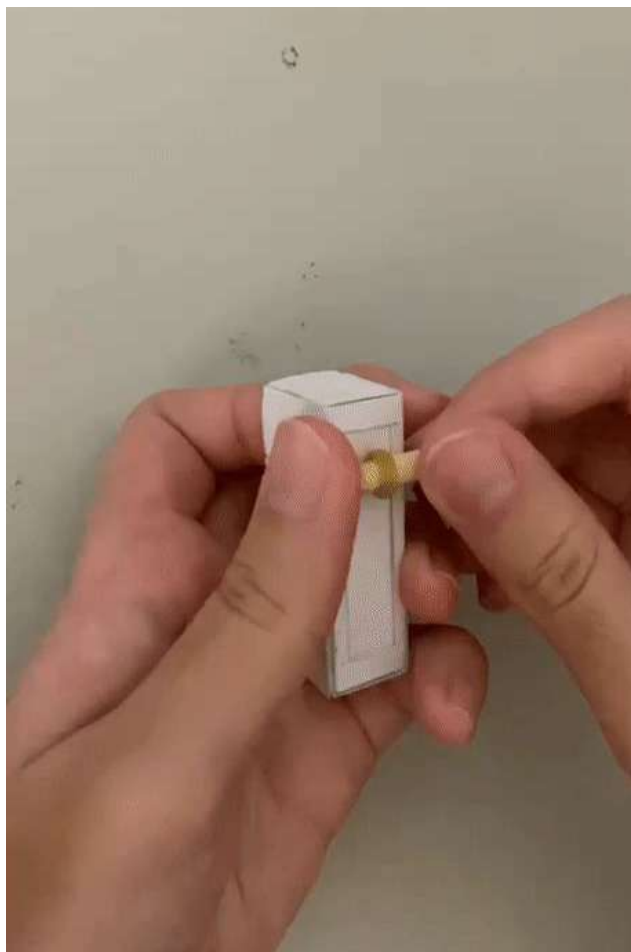
uint8_t colorWhite = ledstrip.Color(255, 255, 255);
uint8_t colorBlack = ledstrip.Color(0, 0, 0);

bool CoinInserted = false;
bool ChosenOneGenerated = false;
bool SwitchPanicGenerated = false;
bool Checked = false;
bool AllWallsOff = false;
bool Surprised = false;
bool Fall = false;
bool CoinAlreadyInserted = false;
bool Web = false;

const int sensorPin = 3;
const int GreenSensorVal = 0;
const int BrownSensorVal = 0; //from 0 to 1023

void setup() {
  //LED init
  ledstrip.begin();
  ledstrip.show();
  ledstrip.setBrightness(100);
  Serial.begin(9600);
  pinMode(13, INPUT_PULLUP);
  pinMode(46, INPUT_PULLUP);
  pinMode(47, INPUT_PULLUP);
  generateRandomLED();
  randomSeed(555555555);
}
```

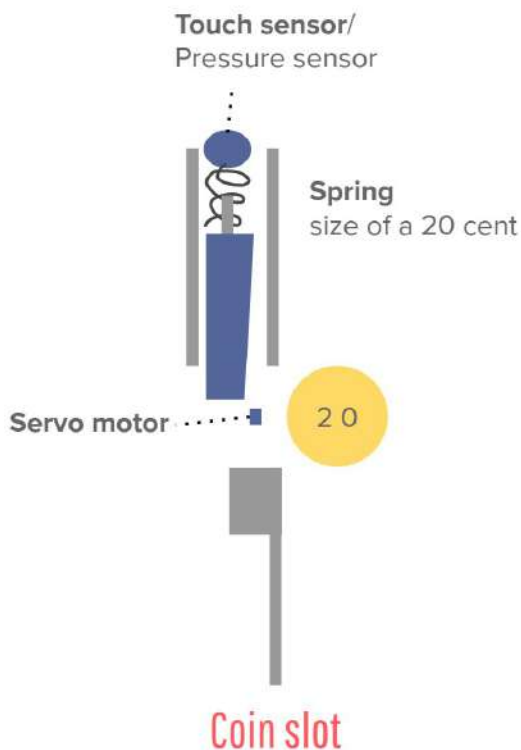
Mechanism for messages and coin slot:



Week 6 (21 Feb)

We managed to get our toggle switches by this week and since it was our first time using it, we played around with it to see how it would work. For the mechanism, we made some changes to our coin slot mechanism. We also compiled the materials and calculated the costs we required so that we could get them by the end of the week.

	A	B	C
1		Materials	Coding
2	1. 24 light bulbs light up and 1 off	(5) Arduino Uno (25) LEDs - SGBOTICS (25) Toggle Switch	- Choose one random number from 1-25, coressponding lightbulb dim
3	2. User insert 20 cents into the machine	(1) Push Button (1) Servo motor	- Contraption(?) to sense 20 cents coins to activate machine
4	3. LED strip around light bulbs lights up to indicate game start3.	1 or 2 LED Strips	- After sensing 20 cents, LED turn on
5	4. User flips one switch		- One random number from 1-25 is chosen
6	5. If unsuccessful, the off-ed light bulb will light up and another random lightbulb will off. LED strip will off too. The printer will print a loser message.	Mechanism that pushes slips of paper out (2) continucus servo motor (2) boxes for notes Loser notes	- If 2 random numbers does not match, another random number will be chosen and the corresponding bulb will light up. LED off. Release loser note.
7	6. Another user comes and makes sures that all the switches are off before inserting another 20 cents		- If all switches are not offed before the 20 cents is inserted, switches and game will not be activated.
8	7. This continues until someone successfully switches on all the bulbs and the prize money will do a fall.	Mechanism that allows the money to fall out (1) Servo motor	- If 2 random numbers match, servo will open to release the prize moolah from the box.
9	The whole setup	Wood	



Week 7 (28 Feb)

Since we decided not to use light bulbs, we tried using ping pong balls to cover regular 3mm LEDs to see if it would give us a light bulb effect. However, after trying we realised the ping pong balls were way too dim to see the difference between the lit and unlit ones.

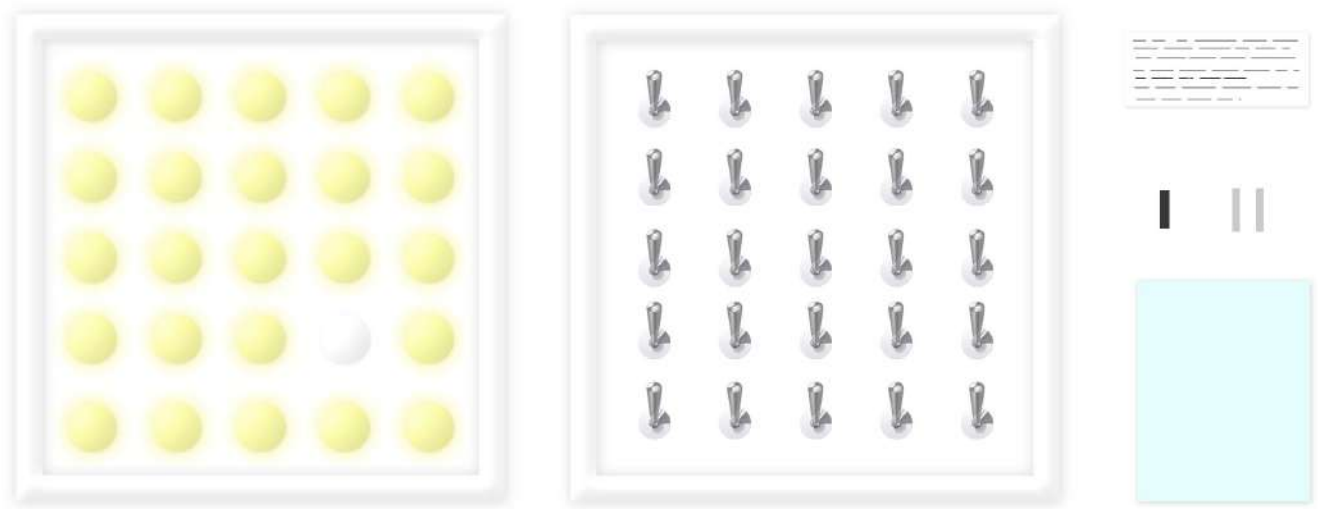
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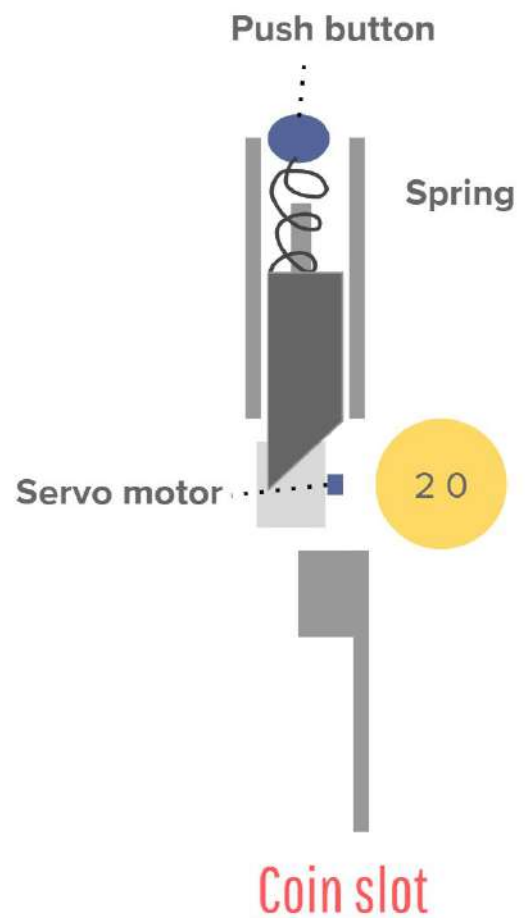
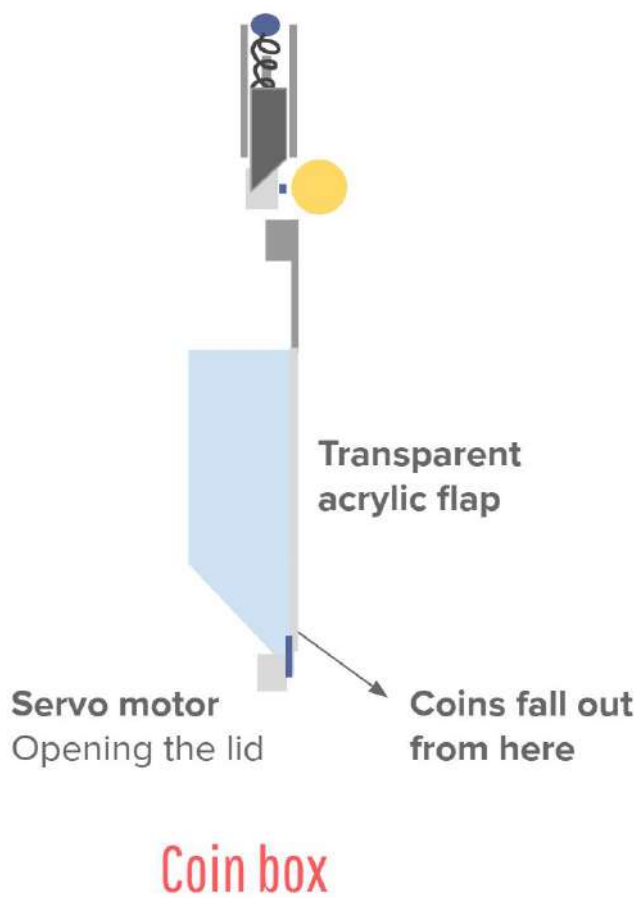
We started to come up with loser messages (this was an ongoing process, we came up with the messages as we were doing the rest of the project) and finalised how our completed setup would look.

LOSER MESSAGES

1. My mum could have done better!
2. Shame on you LOSER
3. Don't waste my time, go home lah!
4. Honestly, why'd you even bother to try
5. You see the dustbin in the lobby? Ya, jump in you trash
6. Congrats on setting a new Guinness World record for stupidity
7. You have one job and you screwed it up, what can you even achieve in life
8. You are so unlucky that even a black cat doesn't want to cross your path
9. Are you ok? You must be feeling light headed all the time since it's so empty
10. Use the Bad luck Brian (meme) in words "I have better luck than you"
11. I heard the loser club is recruiting, thought you might wanna check it out
12. It's impossible to underestimate you.
13. The wise man takes the high road. But, you, no. You're an idiot!
14. Error 404. Winner not found. You LOSER
15. Could you stop skipping the thinking process when you respond?
16. Losing must be your favourite pastime.
17. NO I'm not insulting you. I'm just describing you.
18. You guys asked for a joke? Well you're in luck, cause you already are one!
19. I'm not saying that you're stupid, I'm just saying that you've got bad luck when it comes to thinking.



We also refined our coin slot and coin box mechanism.

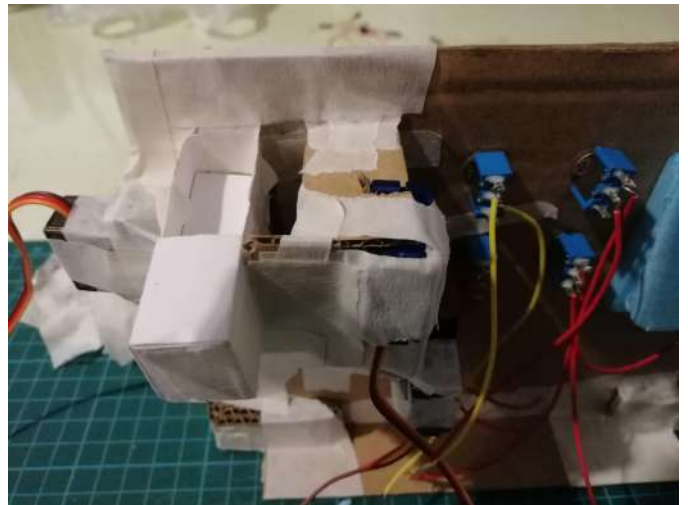


Recess Week (6 Mar)

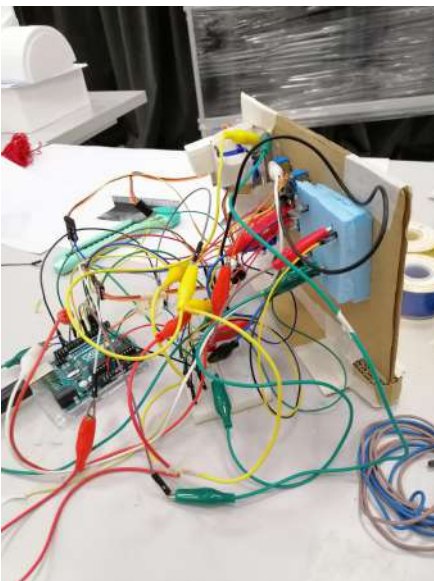
We had a shopping trip to Sim Lim Tower to buy the needed materials. We built the prototype using cardboard and masking tape as the supporting structure.



We then attached 2 servo motors, one to be used to block the coins and one to be used for churning the messages out, and also used a limit switch as the coin trigger.



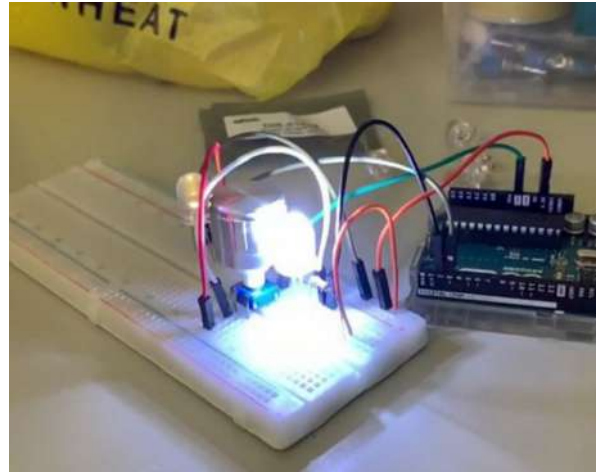
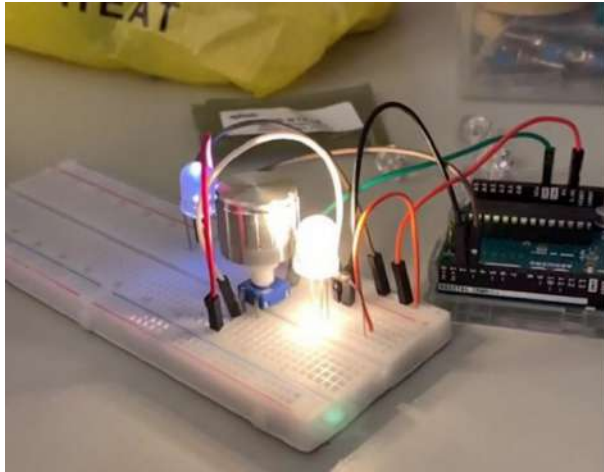
The prototype was a scaled-down version of our actual device, so we only used 4 LEDs and 4 switches instead of 25 to test out the logic of our code and to see if it worked.



At this point, we realised that the paper notes are not very reliable and decided to use acrylic for the loser and winner messages instead.

Week 8 (13 Mar)

We received the cool white LEDs brought from SGbotics and tested it out to compare with warm white LEDs we brought from Sim Lim Tower.



We decided on the warm white LEDs because they resemble real light bulbs and gave a more welcoming vibe. We then made it such that it is harder to win the game by coding 2 rows of dummy switches.

```
//Generate Number for Switches - If any of the Switch is flicked, activate call NumberCheck function
void FlickSwitch(){
  if ((CoinInserted == true) && (SwitchRandGenerated == false)) {
    if ((SwitchValue1 > 200) || (SwitchValue2 > 100)){
      SwitchRand = 99;
      Serial.println("Switch-rand");
      Serial.println(SwitchRand);
      SwitchRandGenerated = true;
      NumbersCheck();
    }
    else if ((SwitchValue3 > 80) || (SwitchValue4 > 150) || (SwitchValue5 > 200)) {
      SwitchRand = random(22,46);
      Serial.println("Switch-rand");
      Serial.println(SwitchRand);
      SwitchRandGenerated = true;
      NumbersCheck();
    }
  }
}
```

This means that if the participant were to flick any of these 10 switches, they would not actually affect the outcome and would lose the game. We also worked out the dimensions and layout with accurate measurements for construction of the final machine.



Week 9 (20 Mar)

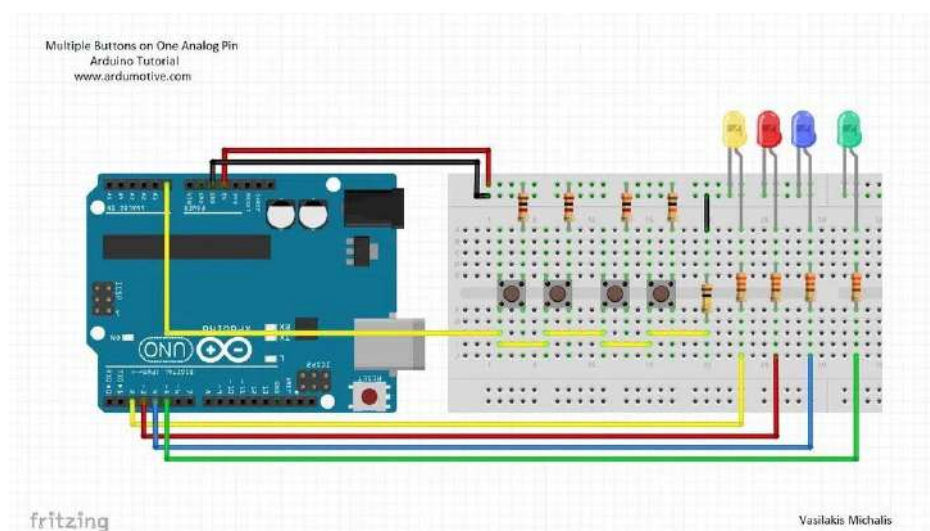
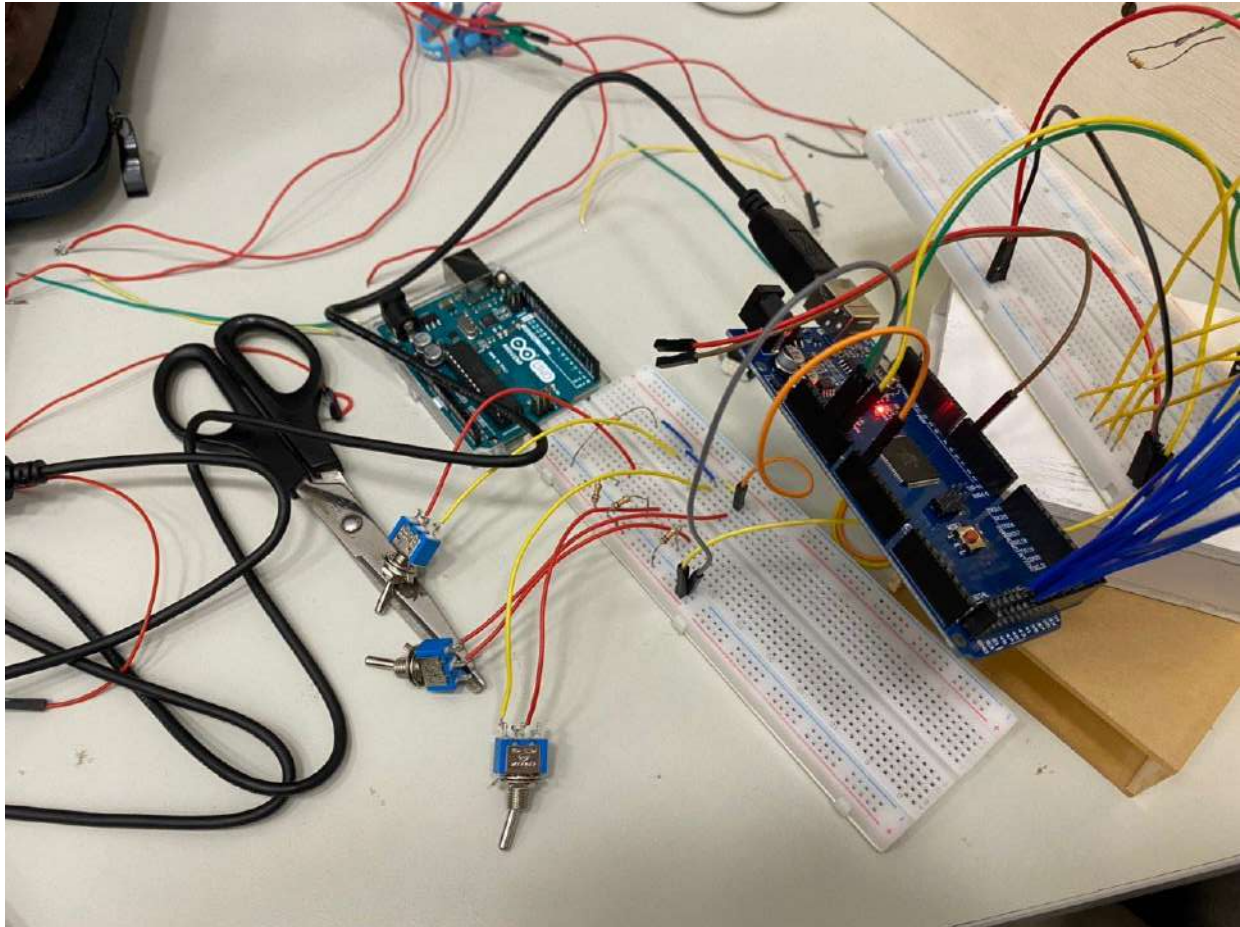
After our layout is confirmed, we created the template for laser cutting on Illustrator and proceeded with cutting the wood and acrylic needed for our main frame and components respectively.



Initially, we wanted to use 5 Arduino UNO boards, with 1 “master” board to control 4 other “slave” boards, because we had too many components to connect. However, we noticed that because of the multiple connections from one board to another, there was communication delay, making it such that there was input lag (e.g. flicking a switch would not immediately trigger a certain action).

```
// ChooseRandomLED x - CHOSEN ONE LED TO OFF, STORE VALUE INSIDE ChosenOne
void GenerateRandomLED(){
  if (ChosenOneGenerated == false) {
    ChosenOne = random(1,4); // choose random bulb 1 - 4
    if (ChosenOne >= 1 && ChosenOne <= 2){ // ChosenOne = 1, 2
      Wire.beginTransmission(1); // start transmission to Slave on address 1
      Wire.write(ChosenOne);
      Wire.endTransmission();
    }
    if (ChosenOne >= 3 && ChosenOne <= 4){ // // ChosenOne = 3, 4
      Wire.beginTransmission(2); // start transmission to Slave on address 2
      Wire.write(ChosenOne);
      Wire.endTransmission();
    }
    Serial.println("ChosenOne = ");
    Serial.println(ChosenOne);
    ChosenOneGenerated = true;
  }
}
```


Since we had access to an Arduino MEGA board, and a MEGA board could accommodate all our components, we decided to use just one main Arduino MEGA board to reduce the input lag. We also updated our code for the switches to incorporate resistors so that we only needed one pin per 5 switches.



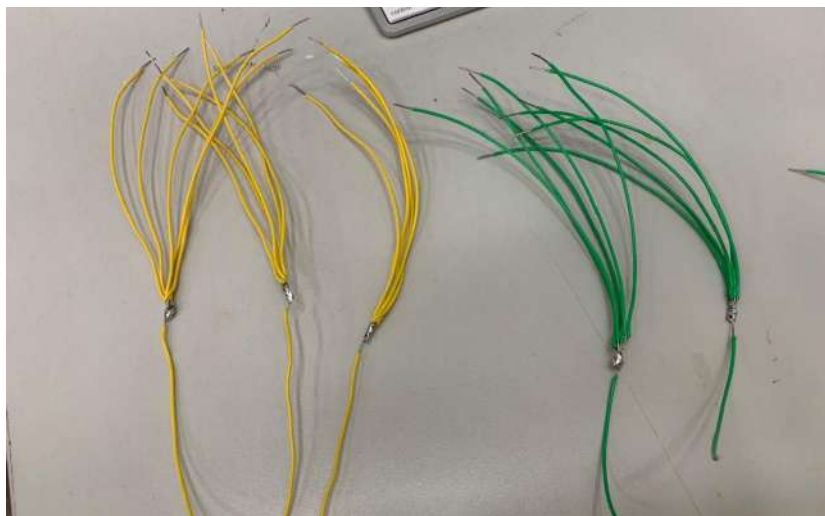
Week 10 (27 Mar)

We started soldering the LED bulbs with the resistors to the desired wire lengths.

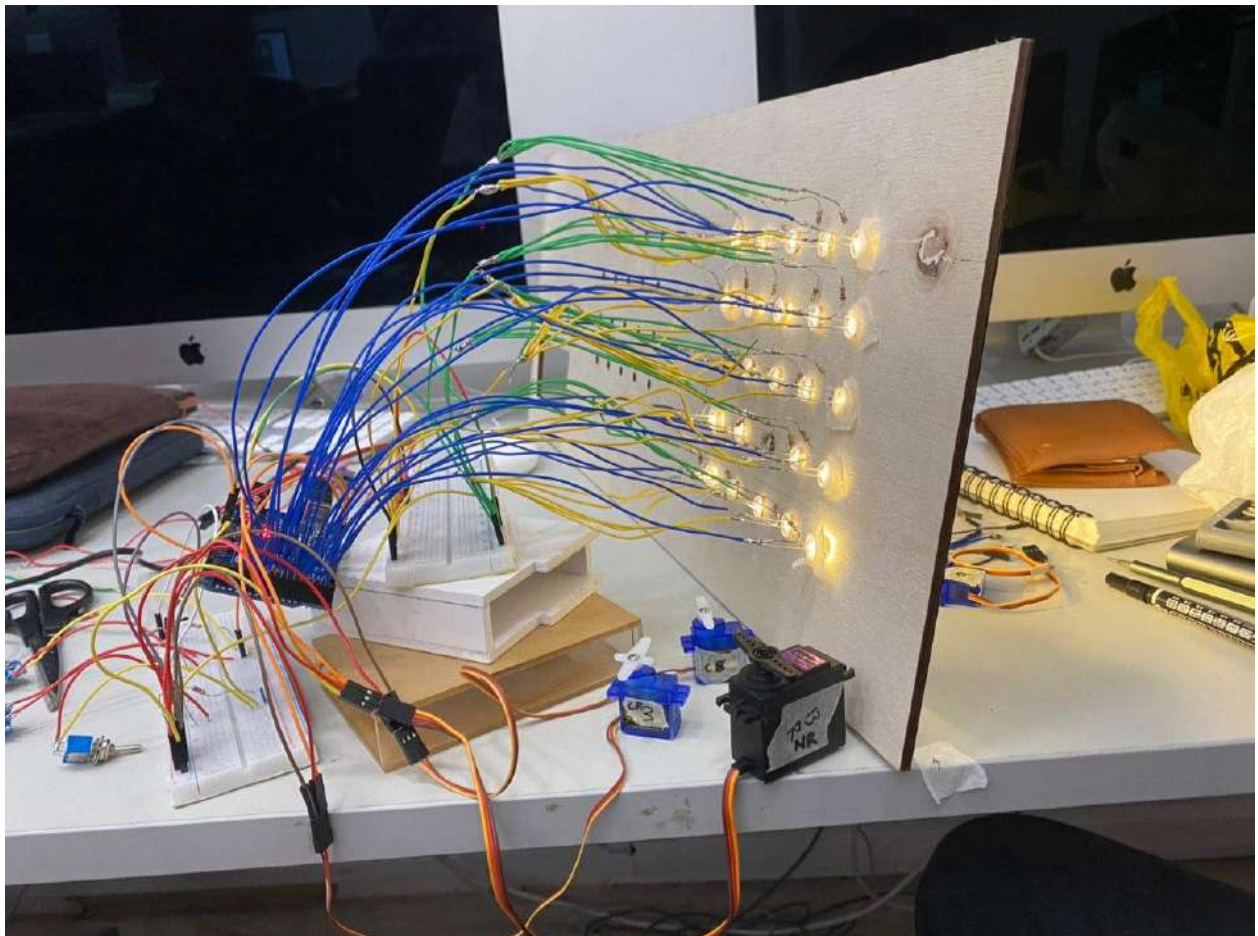
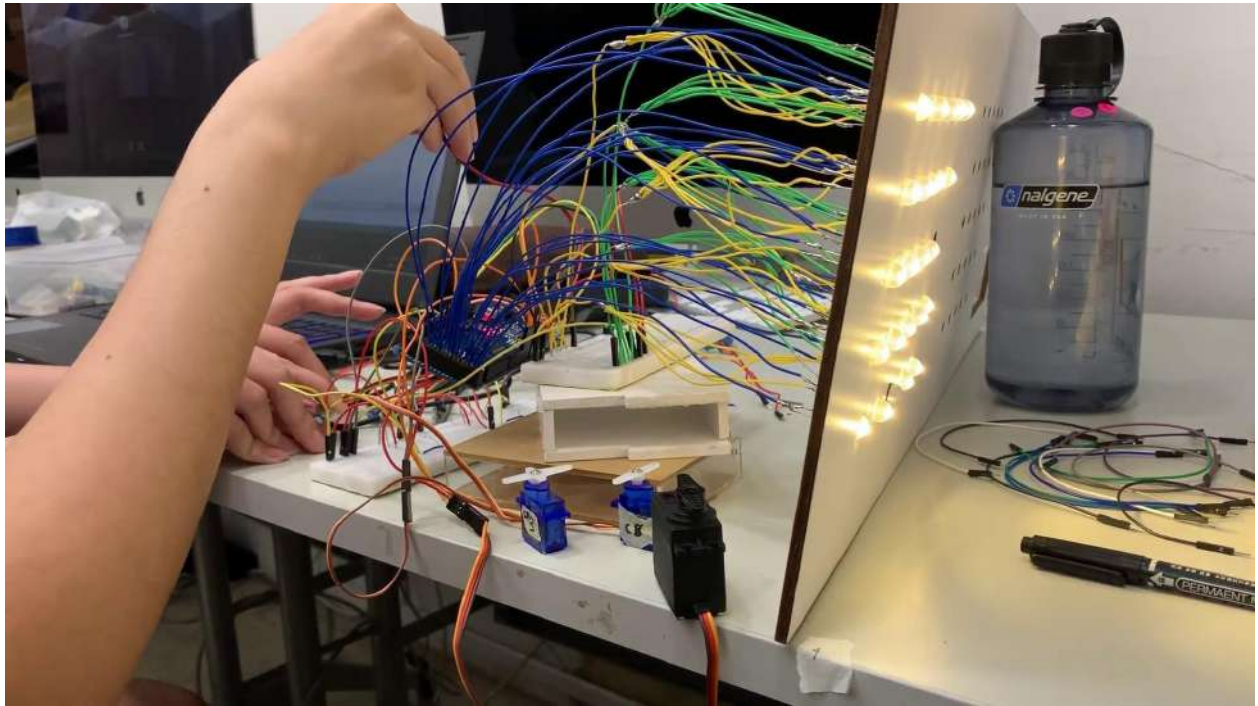
(Click to watch the video)



In order to minimise the number of wires we had to deal with during the assembly, we decided to link the ground and voltage wires for each row of LEDs. So we ended up with 5 ground and 5 voltage wires instead of 25 each.

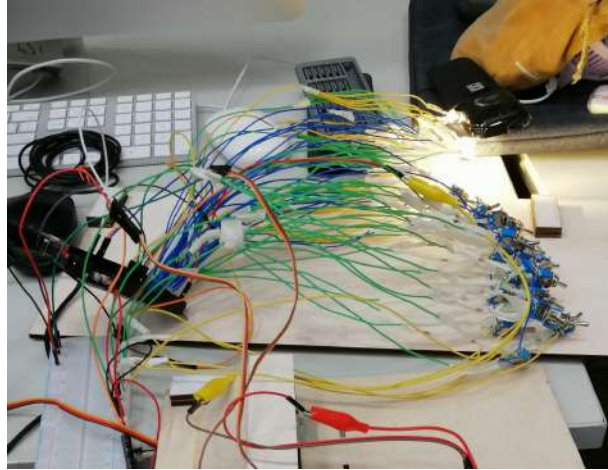


After testing out the code for the resistors and switches, we added it to our main code and tested it with the hardware and it worked well!
(Click to watch the video)



Week 11 (3 Apr)

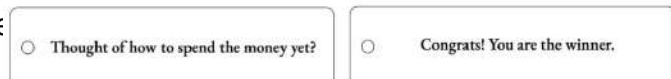
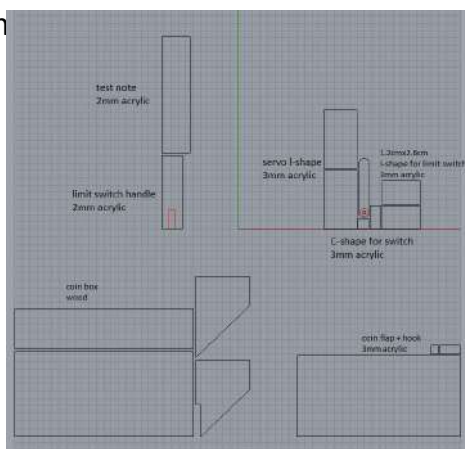
Same as the LEDs, we solder the wires with switches to minimise the use of wires and pins. Since the exposed wire parts may cause errors or the power to trip if they came into accidental contact with one another, we covered the exposed wires with masking tape as an insulator.



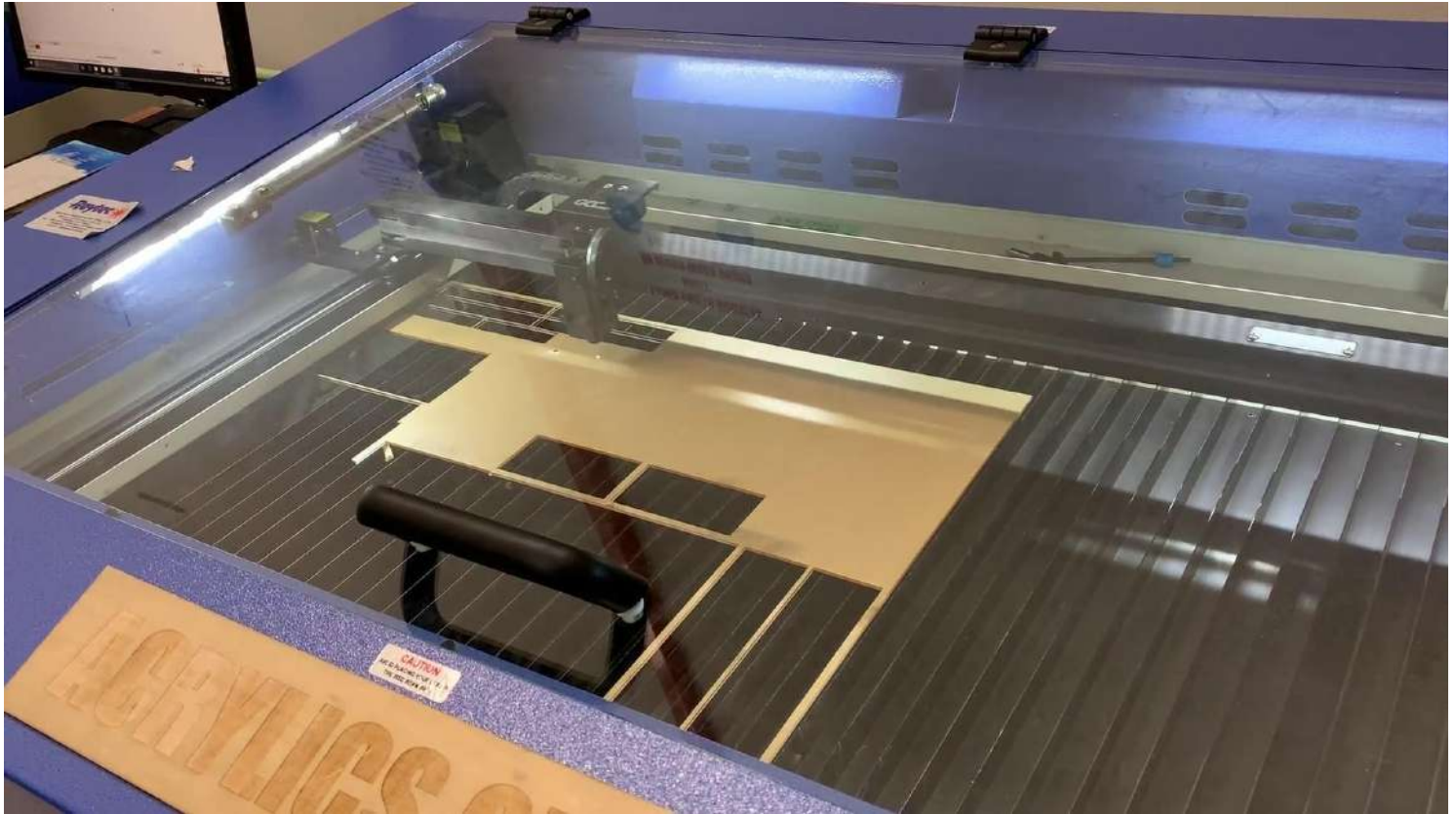
We managed to figure out and construct a coin slot mechanism using a limit switch. We measured and found an appropriate angle that works, which means that it is just right for the size of a 20-cent coin and would not get stuck in place. We assembled the coin slot with acrylic and secured it with hot glue.



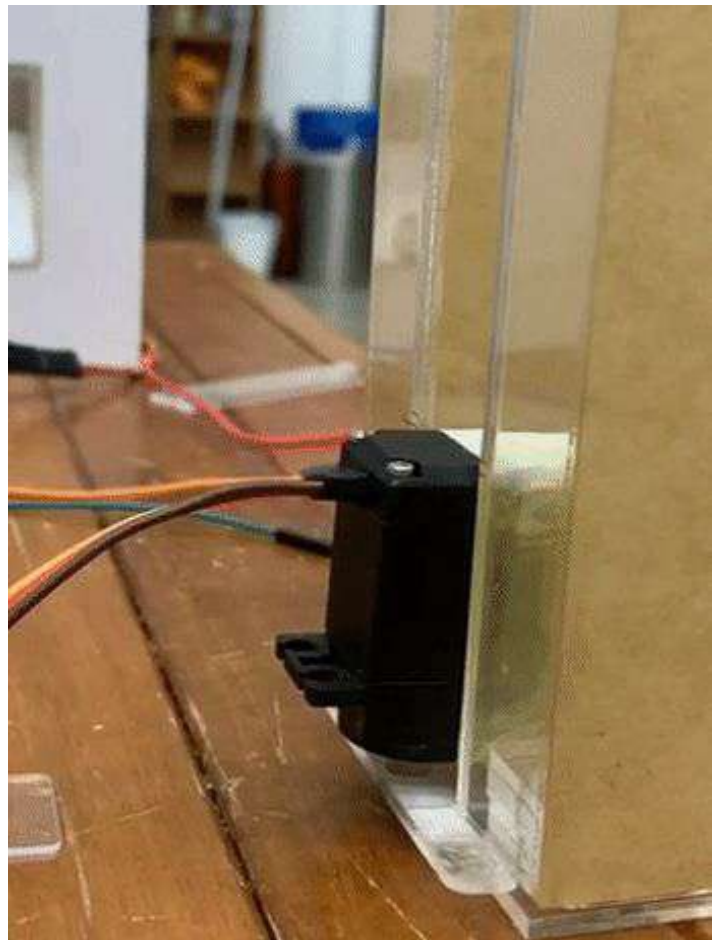
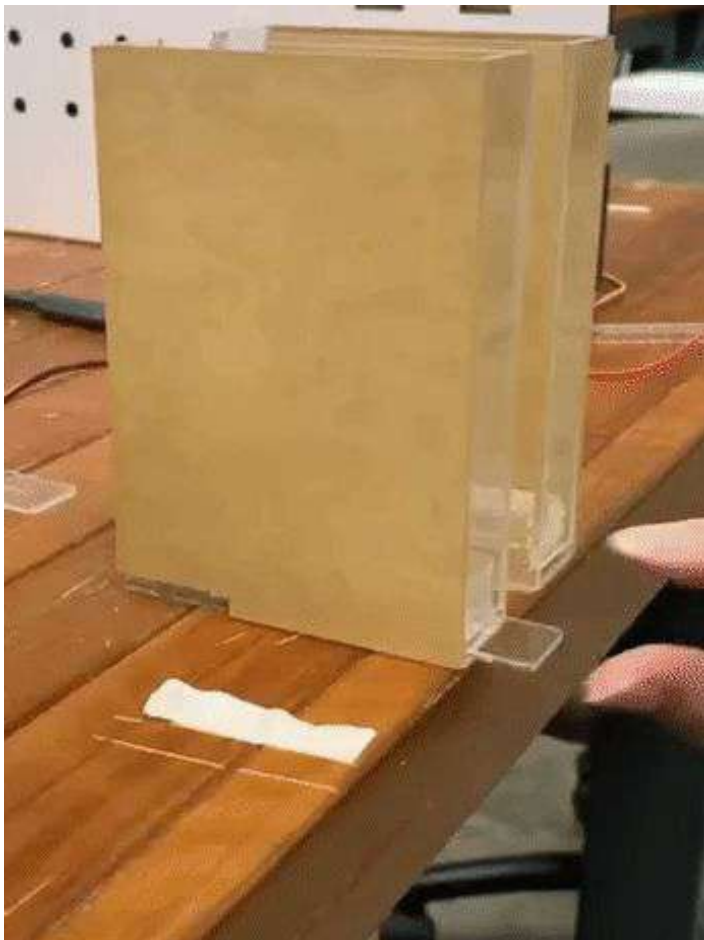
As the circuit breaker was announced suddenly, we had no choice but to come up with the contents of the win



Video of the laser cutting:
(Click to watch the video)

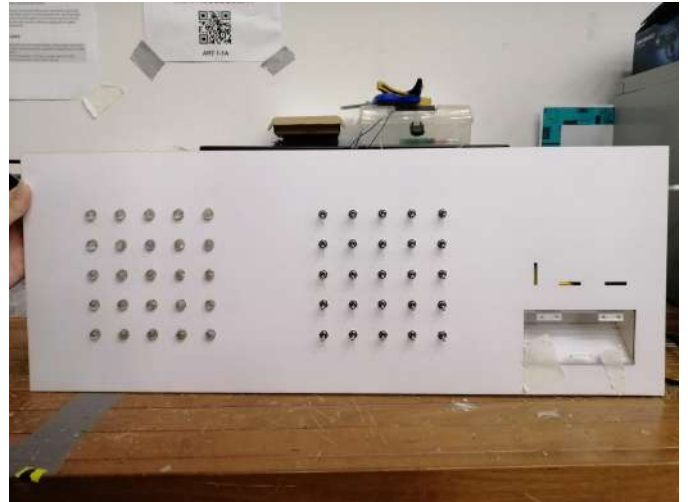
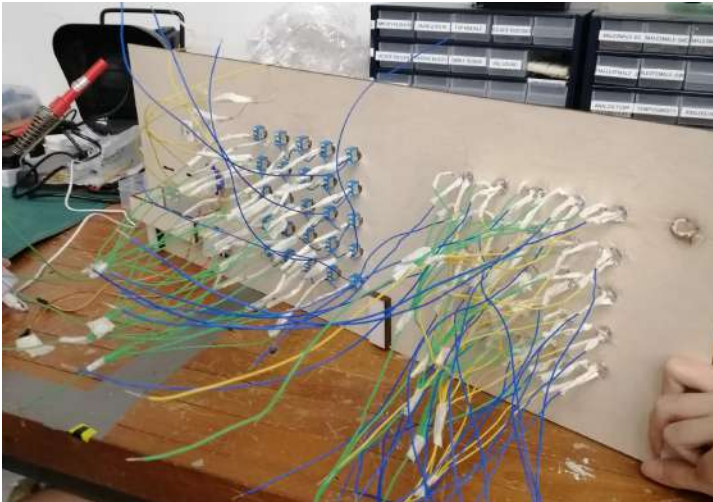


The note boxes in action:



Week 12 (10 Apr, but due to the circuit breaker, we finished this by week 11)

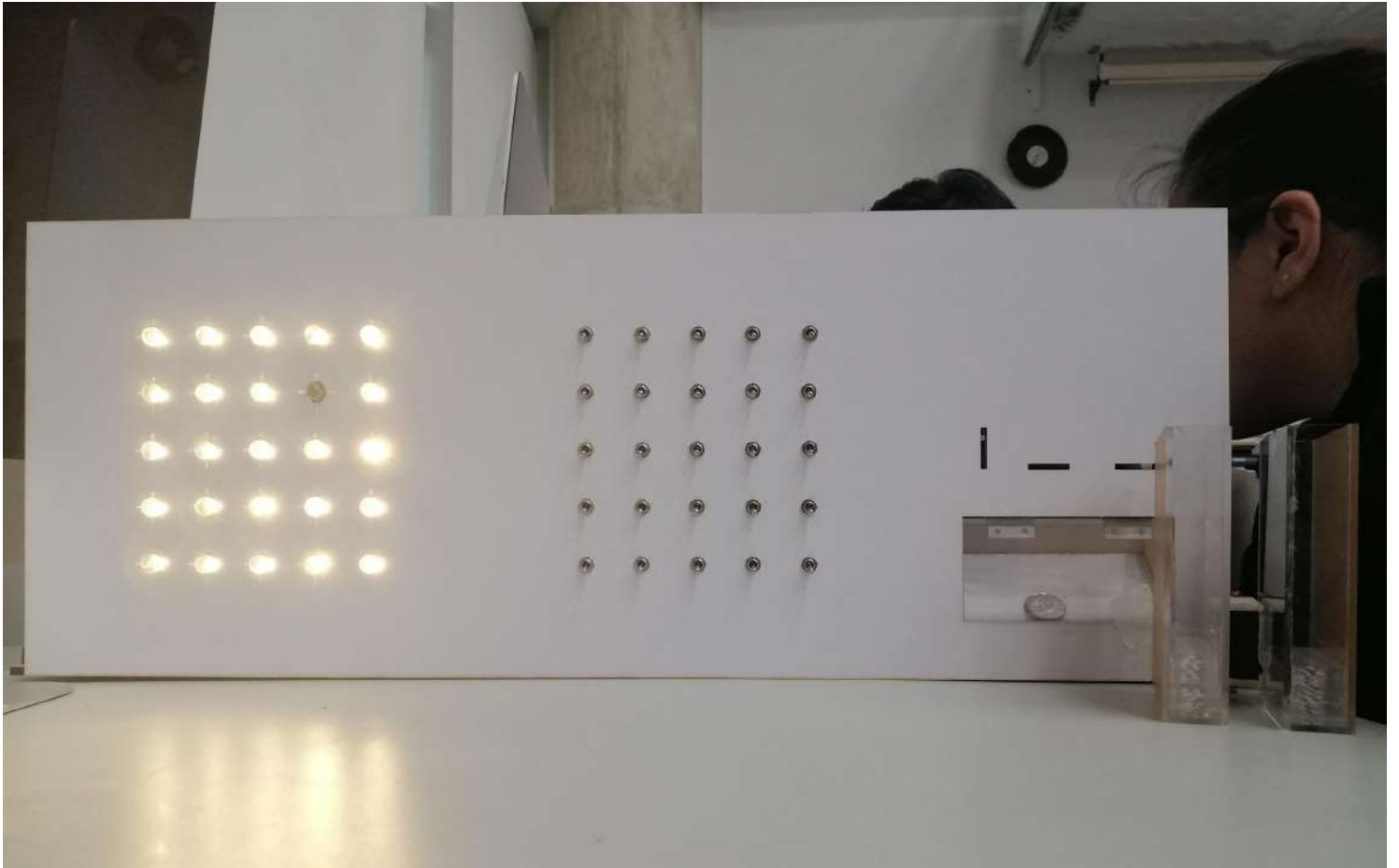
By this week, our main components were more or less done separately, and we came together to finally put everything together into one device.



To hold the main frame securely together, we used metal supports and screws to stabilise the structure so that it is strong enough to stand on its own, and also withstand the flicking action of the player.



After assembling all the components together, we tested it out to see if everything ran smoothly and made small changes to improve the overall experience.



(Click to watch the video)



Week 13 (17 Apr)

The final week of the project - showcase. A day before the showcase we had an online meet-up to test it a final time, to make sure the machine was still working fine because due to the circuit breaker, we were unable to be physically present to troubleshoot any issues. Our machine actually stopped working for a bit because of the amount of power that was needed to power our entire setup, the Arduino MEGA board was slightly overworked. In the end, we powered the Arduino MEGA board with a portable charger and that proved to be more stable than using the laptop as a power supply.

(Click to watch the video)

