Creative Making: Advanced Physical Computing Blog

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Week 1 - Ideation

In my cognition, I always hope to make installation to reflect something, so that the situation can be improved or stopped deteriorating. I think this is the emotion I most want to express through art. So, I started crazy research and brainstorming, watched a lot of news and various short documentaries, so I found a very interesting and worrying topic - traditional things are disappearing.

Traditional things are being forgotten by us. If we do not pay attention now, many traditional folk cultures will disappear completely in the future. After a lot of data collection, I think shadow puppet is the most neglected art among traditional folk arts. Because of its complex production process and strong performance skills, the number of shadow puppets promoted by people has declined seriously since the end of the last century. In addition, I chose shadow puppet art as my installation element because of its delicate and interesting appearance.

As a product of a period, shadow puppets have brought countless good memories to people. But with the advent of technology such as televisions and computers, few people have passed on this traditional folk art, so I tried my best to keep this classic visual form.

Week 2 - Inspiration Acquisition

With the theme of the installation in mind, I began to frantically browse the internet for inspiration on various photos related to tradition, feudalism, interaction and so on.

I put together the following photos that could inspire me.

(Each corresponds to a different part of my installation)

1. **Bird cage:** this image gives me a preliminary idea of the appearance of the installation. The shadow play is bound like a bird and cannot fly in the wider sky.

2. **Chinese lantern:** I think the appearance material of the lantern is very suitable for the light transmission part of the installation. I have been exposed to this kind of paper when I was in China, which is very light and soft. It fits perfectly.

3. **Water well rope:** I have imagined countless possibilities in my mind about how to make shadow puppet move. wood stick? wire? All ended in failure. Until I saw this picture that inspired me. Using this transmission structure, the limbs and servo of the shadow puppet can achieve the telescopic effect.

4. **Shackle cage:** It is difficult to see such photos on the Internet. The first keyword I searched was prison. But I happened to see this picture, which gave me a great inspiration for the internal structure of the installation. Therefore, I intend to use this form of framework to express imprisonment.

5.**Table football:** I used to play this kind of interesting and intense game every time I had a party with my classmates or went to the car maintenance with my father. This is also the reason why I originally planned to use the potentiometer to directly interact with shadow puppet characters.
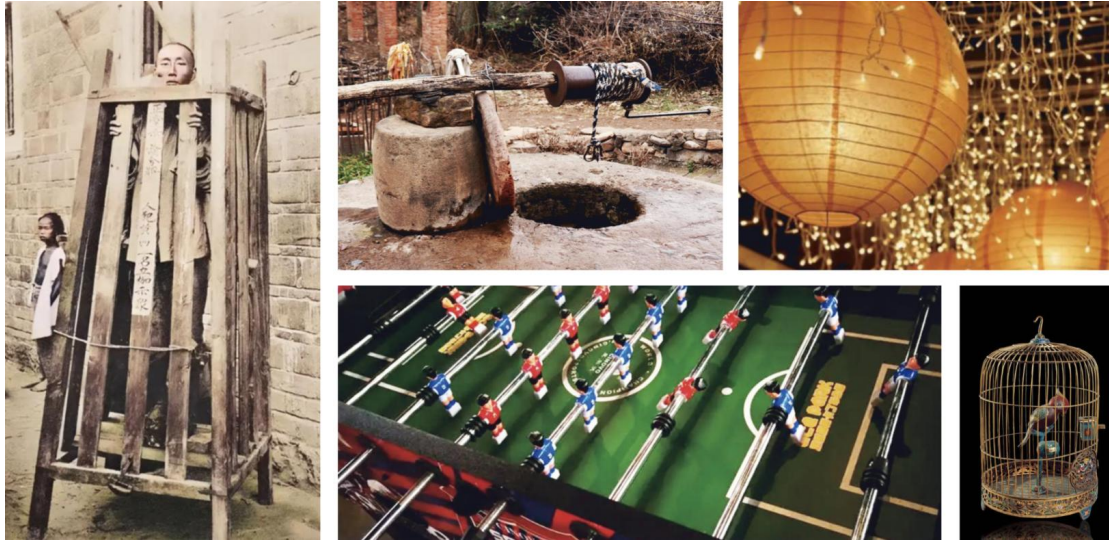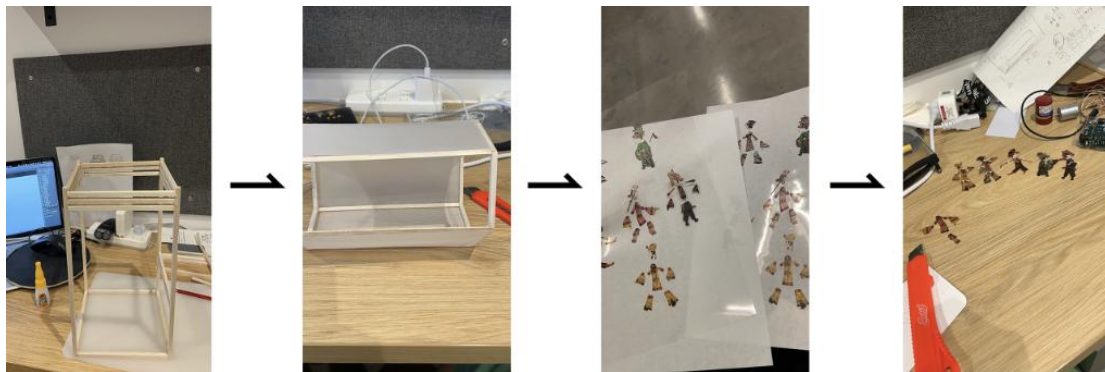
Week 3 - Installation Appearance

Based on the inspiration of last week, I drew the basic image of my

installation in the software and replaced it with different colors for backup.

After that, I began to collect materials, tools, etc. and used software to

draw the limbs of the shadow figure separately.
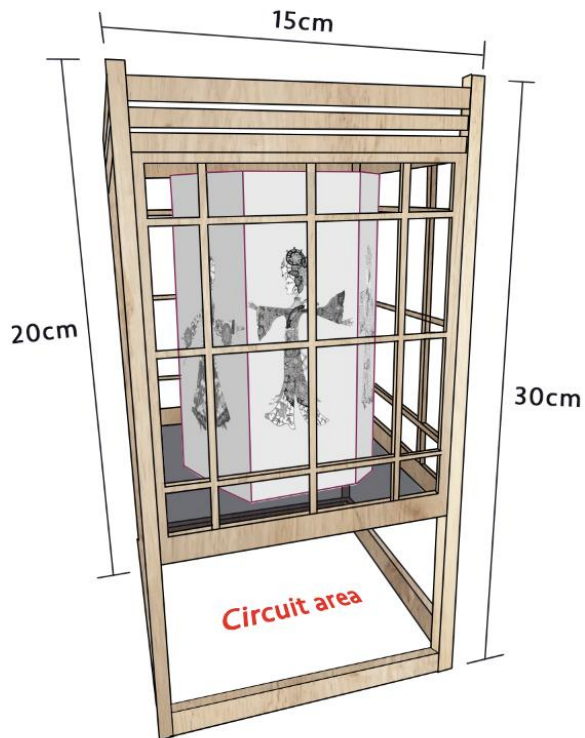
There were also many small problems in the production process.

1. For example, there are deviations and insufficient glue strength when pasting the wooden frame.

2. The glue accidentally smudged the screen when pasting the paper.

3. Insufficient flexibility of limbs after shadow puppet cutting.

Week 4 - Coding & Assembling

This week, I mainly turned the installation code into an implementable interactive form. Mainly used: Distance sensor, Potentiometer, LED and Servo to cooperate with each other.

The overall appearance of the installation is like a cage, representing that traditional culture is being isolated by us, so we should protect it. When our hand is close to the installation, the distance sensor will make the LED light up. When the distance gets farther, the LED will dim again. This represents that the spread of traditional culture needs our continuous attention. In addition, we can rotate the potentiometer to interact with the shadow puppet characters in real time.

When I was working on the code, I wasted a lot of time due to my inexperience. Also the distance sensor was very unstable in terms of sensing values at long distances, which forced me to adjust the effective distance I had envisaged at the beginning. I think I prefer making structures to making codes.

Coding:

```cpp
#include <Adafruit_NeoPixel.h>
#ifdef __AVR__
#include <avr/power.h>
#endif

#define LIGHTDISTANCE  28.0
#define LIGHTMAX       255.0
#define LIGHTMIN       0.0

#define PIN            10
#define NUMPIXELS      34

#define Trig           13
#define Echo           12

Adafruit_NeoPixel pixels = Adafruit_NeoPixel(NUMPIXELS, PIN, NEO_GRB + NEO_KHZ800);

float cm0;
float cm;
float temp = 0;
float ledValue;
float readValue;
int j=0;
int light = 0;
int servopin = 3;
const int motor = A0;
const int rotate = A2;

void servopulse(int angle){
  for(int i = 0; i<50; i++){
  int pulsewidth=(angle*11)+500;
  digitalWrite(servopin,HIGH);
  delayMicroseconds(pulsewidth);
  digitalWrite(servopin,LOW);
  delayMicroseconds(20000-pulsewidth);
  }
}
```

```cpp
float clean(float num){
  float a;
  if(num > 900.0){
  a = 2.5;
  }

  else if(num >= LIGHTDISTANCE-0.6){
  a = LIGHTDISTANCE;
  }

  else{
  a = num;
  }

  }
  return a;
}

float mapclean(float input1, float range1start, float range1end, float range2start, float range2end){
  float output1 = (input1-range1start)/(range1end - range1start)*(range2end-range2start) + range2start;
  if(output1 < range2end){
    output1 = range2end;
  }
  else if(output1 > range2start){
    output1 = range2start;
  }
  return output1;
}

void setup(){
  Serial.begin(9600);
  pinMode(Trig, OUTPUT);
  pinMode(Echo, INPUT);
  pinMode(motor, OUTPUT);
  pinMode(servopin, OUTPUT);
  pinMode(10,OUTPUT);
  pixels.begin(); // This initializes the NeoPixel library.
}


void loop(){
  digitalWrite(Trig, LOW);
  delayMicroseconds(2);
  digitalWrite(Trig,HIGH);
  delayMicroseconds(10);
  digitalWrite(Trig, LOW);
  temp = float(pulseIn(Echo, HIGH));
  cm0 = (temp * 17 )/1000;

  if(j == 0){
  cm = clean(cm0);
  }
  else if((j > 0) && (clean(cm0) != 2.5)){
  cm = (clean(cm) + clean(cm0))/2;
  }
  else if(clean(cm0) == 2.5){
  cm = cm;
  }
```

```
light = mapclean(cm, 2.5, LIGHTDISTANCE, LIGHTMAX, LIGHTMIN);;
readValue = analogRead(rotate);
float lightr = mapclean(light, LIGHTMAX, LIGHTMIN, 1.00, 0.00);

ledValue = map(readValue, 22, 1021, 0, 180);


servopulse(ledValue);
Serial.println(ledValue);

digitalWrite(10, HIGH);
for(int i=0;i<NUMPIXELS;i++){
  pixels.setPixelColor(i, pixels.Color(lightr*255,lightr*220,lightr*127));
  pixels.show();
}

j++;
delay(1);
}
```
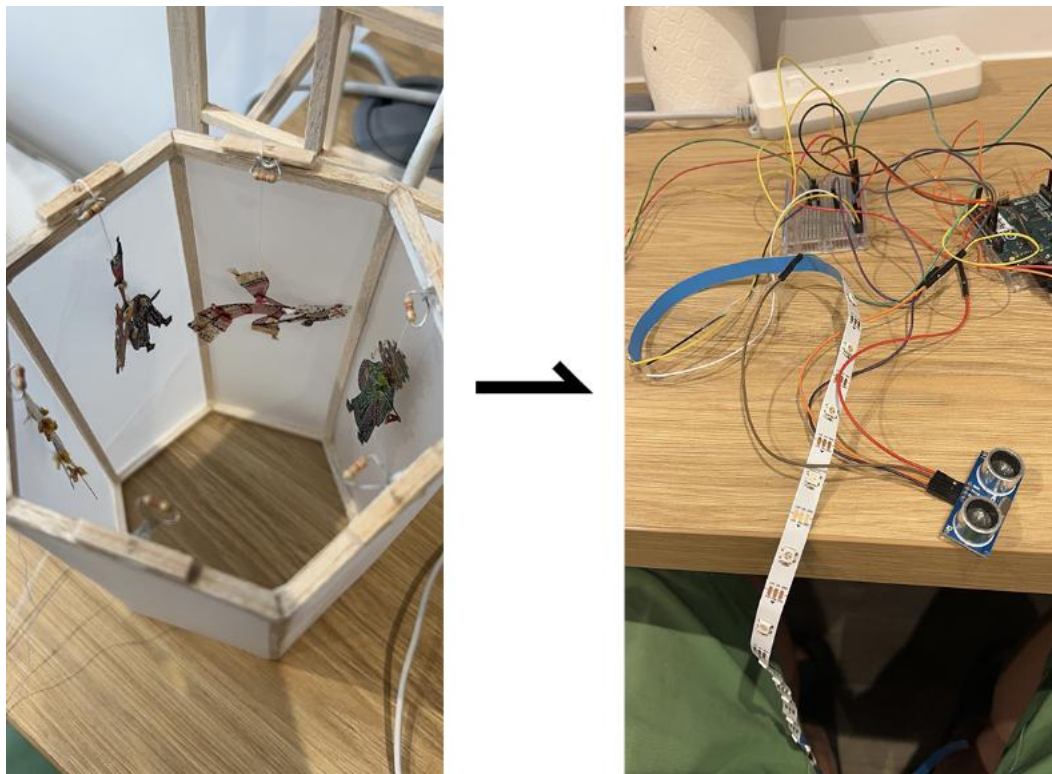
Making:

Week 5 - Final Design

In this week I completed my installation. I repeatedly tested its stability

and interaction fluency. Video was taken and all the later work was

completed. In addition, I shared the process of making the installation

with my roommates and let them participate in the interactive

experience.

Video Link: https://youtu.be/jO4M4Q-19B8