

Creative Making: Advanced physical computing

Firework installation

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Welcome to this creative project I made for term one. It is an electrical firework installation with out using real fire to lit. It is based on the background that in Chinese, these days in most city, people are not allowed to set off fireworks because it will polluting the air and may cause fire hazard, however it is our tradition to set fireworks to celebrate new year. So I want to make an electrical fireworks installation so that people can enjoy any time any where.

Final video link

<https://youtu.be/C87QbsllhBA>

Link towards Github and blog

<https://github.com/ZIqinGX/UAL-CCI--Advanced-Physical-Computing-portfolio-of-work.git>



Design objects:

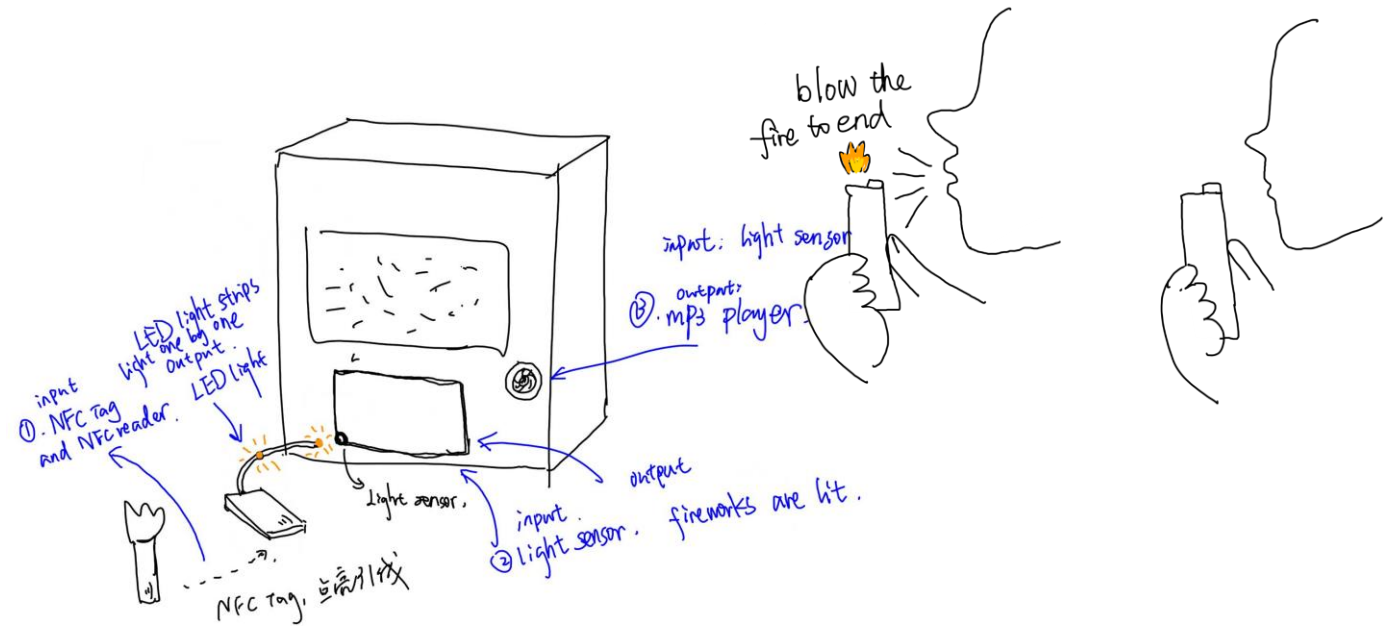
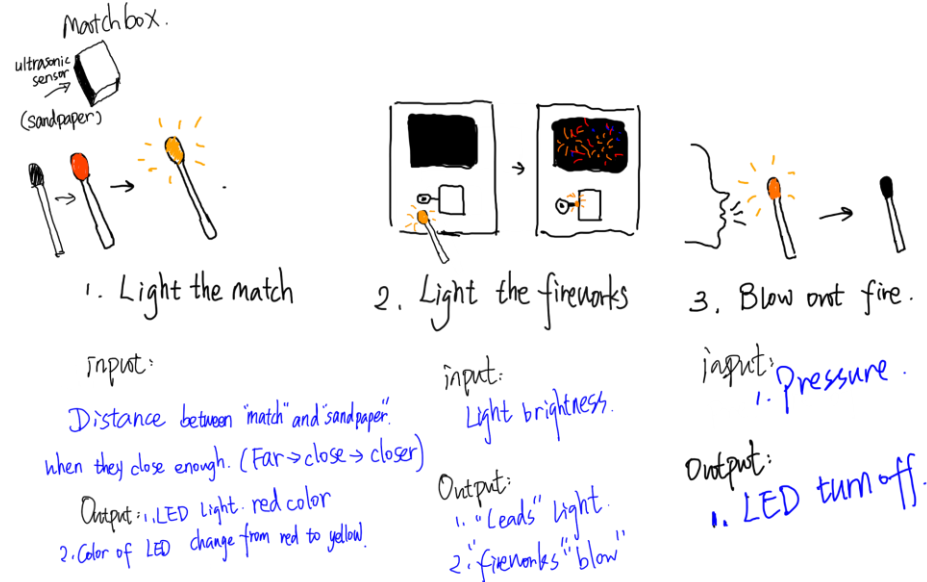
Simulate how people set fireworks in real life

Objects Briefing:

First is how to light the fake fire.

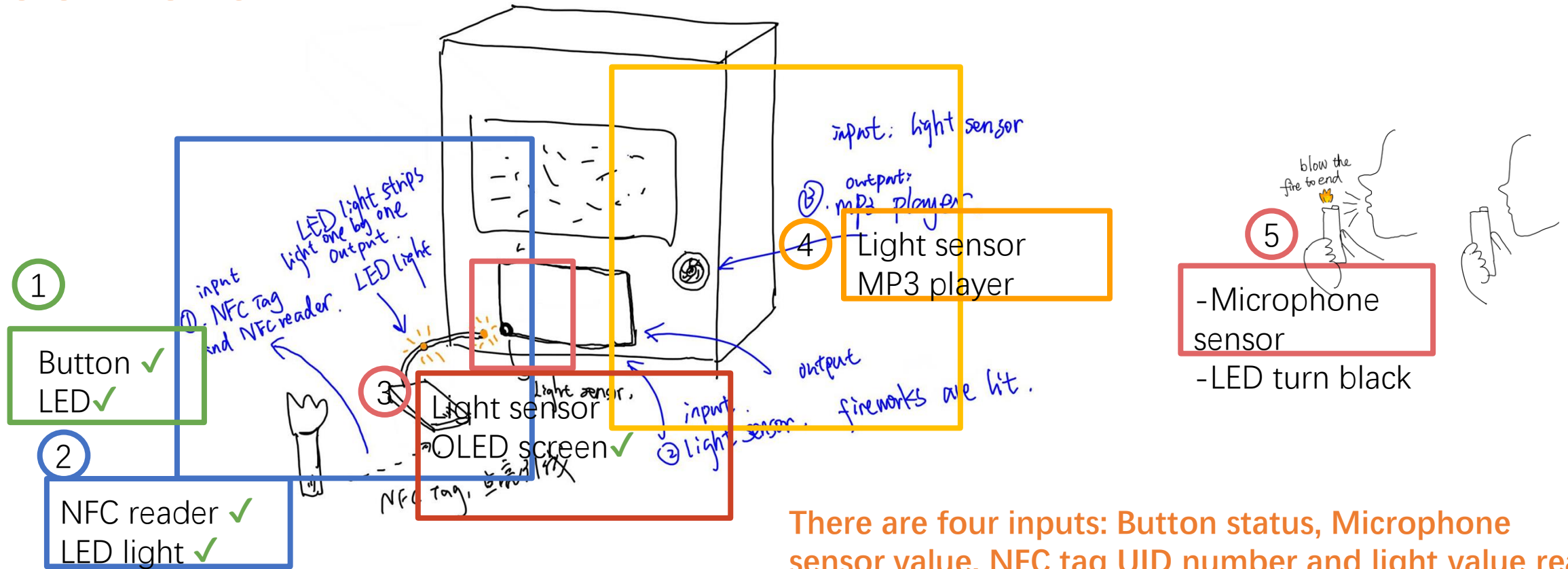
Second is how to show fireworks.

Finally, how to extinguish the fake fire



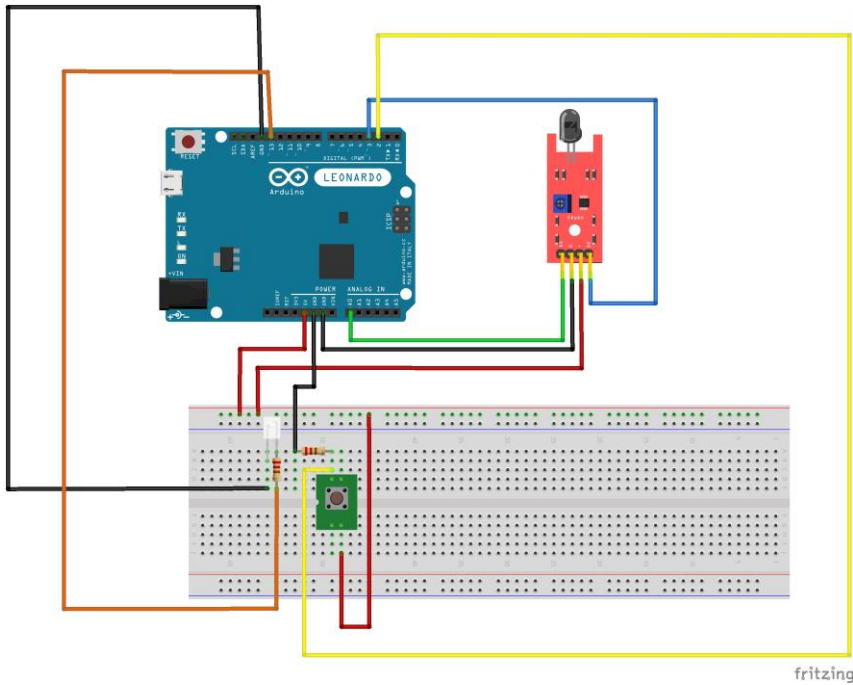
INPUTS

OUTPUTS



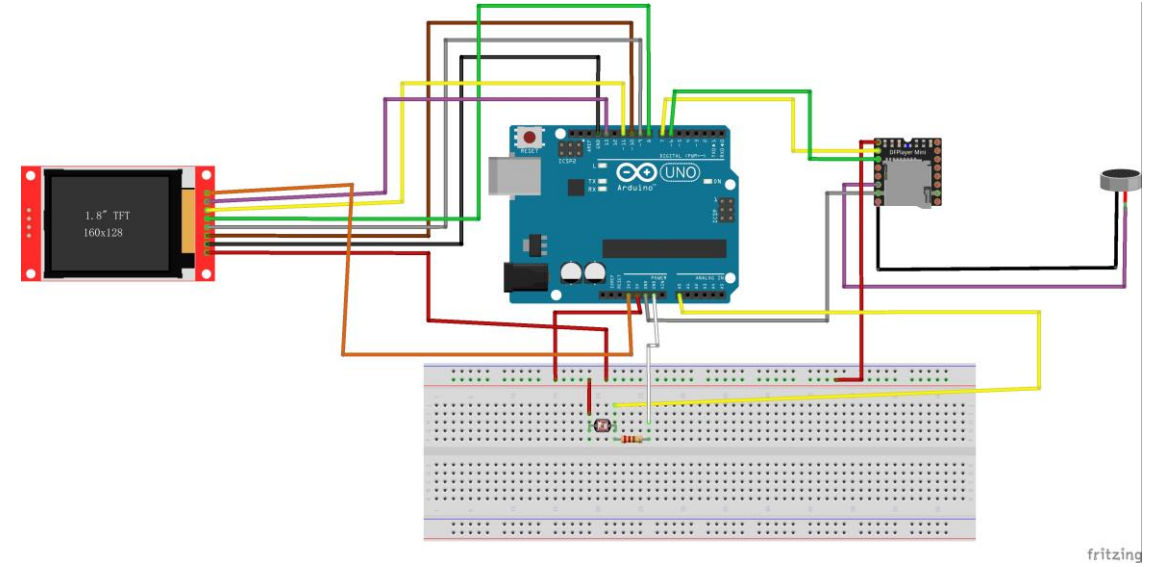
There are four inputs: Button status, Microphone sensor value, NFC tag UID number and light value read by light controlled resistor.

The outputs includes LED, wss2818b LED strip, ST7735 screen, DF MP3 player.

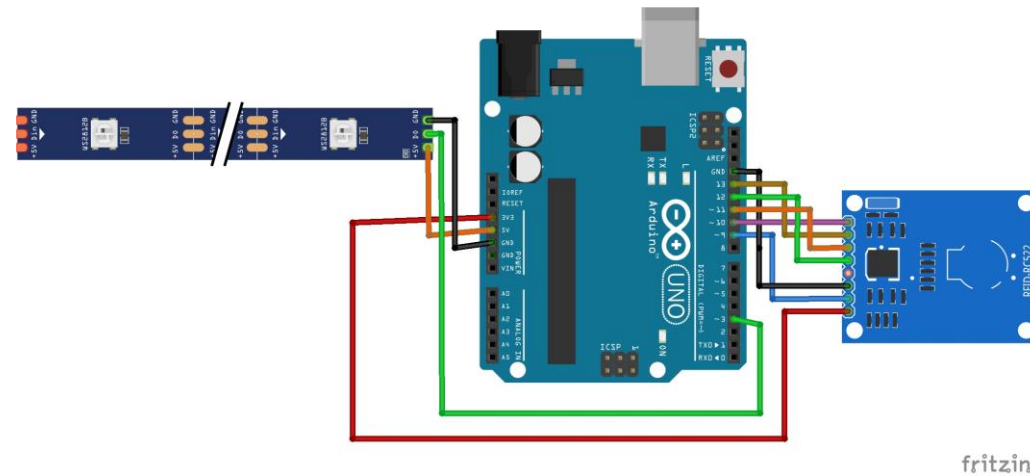


Button and Microphone sensor control LED

Circuits



Light controlled resistor controls TF7735 screen and DF player



RFID reader controls WS2818b strip

```
Button_Microphone_Control_LED | Arduino 1.8.19
256 KB 2048 2.04 KB 0MB

Button_Microphone_Control_LED

const int BUTTON = 2;
const int LED = 13;
const int SOUND_PIN = A0;
int BUTTONstate = 0;

int val = 0;
int old_val = 0;
int state = 0;

void setup() {
  // put your setup code here, to run once:
  pinMode(LED, OUTPUT);
  pinMode(BUTTON, INPUT);
  Serial.begin(9600);
}

void loop() {
  // put your main code here, to run repeatedly:
  val = digitalRead(BUTTON);
  if (val == HIGH && old_val == LOW) {
    state = 1 - state;
    delay(100); // 加入延迟以避免抖动
  }
  old_val = val;

  if (state == 1) {
    Serial.println("pressed");
    digitalWrite(LED, HIGH);
  } else {
    digitalWrite(LED, LOW);
  }

  switch (state == 1) {
    case 1:
      // 返回按钮编号
      int val2 = analogRead(SOUND_PIN);
      // 输出信号
      Serial.println(val2);
    }
  }
}
```

```
light_controlled_sensor_screendisplay | Arduino 1.8.19
256 KB 2048 2.04 KB 0MB

light_controlled_sensor_screendisplay

#include "SoftwareSerial.h"
#include "DHT.h"
#include "Adafruit_GFX.h"
#include "Adafruit_ST7735.h"
#include "Adafruit_ST7789.h"
#include <font/FreeMono12pt7b.h>
#include <font/FreeMono9pt7b.h>
#include <font/FreeMono8pt7b.h>
#include <avr/eeprom.h>

#define TFT_CS 10 // TFT 的片选引脚
#define TFT_DC 8 // TFT 的数据/命令引脚
#define TFT_RST 9 // TFT 复位

const int LED = A0;
int input_val = 0;

Adafruit_ST7735 tft = Adafruit_ST7735(TFT_CS, TFT_DC, TFT_RST);

SoftwareSerial mySoftwareSerial(6, 7); // TX, RX
DHT DHT16(D2, DHT16_TYPE);
void printDetail(const_t type, int value)
{
  void setup()
  {
    //Serial.begin(9600);
    tft.begin(240, 320, 160);
    mySoftwareSerial.begin(9600);
    Serial.begin(115200);

    Serial.println();
    Serial.println("DHT16 DHT16 Mini temp");
    Serial.println("Initializing DHT16 ... (May take 3-5 seconds)");
  }

  // ... (rest of the code)
}
```

```
NFC_tag_knobs_one | Arduino 1.8.19
256 KB 2048 2.04 KB 0MB

NFC_tag_knobs_one

#include <SPI.h>
#include <MFRC522.h>
#include <FastLED.h>

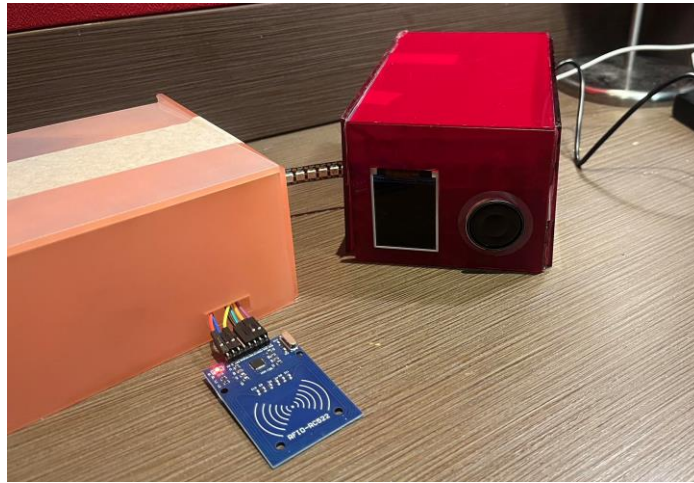
#define NUM_LEDS 20 // 定义 led 数量
#define DATA_PIN 3 // 定义 开发板上的 3 号数据引脚
#define LEDS_DATA_PIN // 定义 LED 数据引脚

#define SS_PIN 10
#define RST_PIN 9
MFRC522 mfrc522(SS_PIN, RST_PIN); // Create MFRC522 instance.

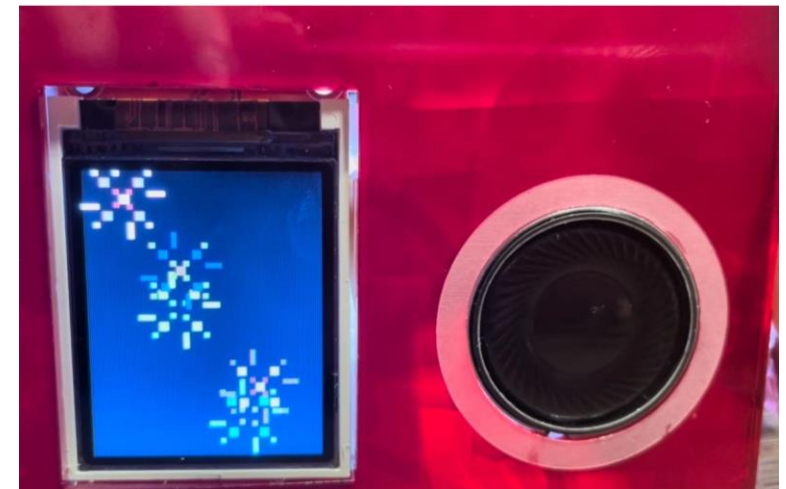
void setup()
{
  Serial.begin(9600); // Initiate a serial communication
  SPI.begin(); // Initiate SPI bus
  mfrc522.PCD_Init(); // Initiate MFRC522
  Serial.println("Approach your card to the reader...");
  Serial.println();
  FastLED.addLeds<WS2812B, DATA_PIN, NUM_LEDS>
}

void loop()
{
  // Look for new cards
  if (! mfrc522.PICC_ReadPresents())
  {
    return;
  }
  // Select one of the cards
  if (! mfrc522.PICC_ReadCardSerial())
  {
    return;
  }
  //Show UID on serial monitor
  Serial.print("UID tag: ");
  String content="";
  byte letter;
  for (byte i = 0; i < mfrc522.uid.size; i++)
  {
    Serial.print(String.fromCharCode(mfrc522.uid.getByte(i)) + " ");
  }
}
```

Link to code
<https://github.com/ZIqinGX/UAL-CCI--Advanced-Physical-Computing-portfolio-of-work.git>



Exhibition



What problem I met for Week 7 :

- 1.the NFC tag is too big for a match, if I use the former plan,it will be not as decent as I planed.
- 2.After change the interaction progress, the progress can be divided into 3 parts.

What problem I met for Week 8 :

1. RFIC reader do not work. It can't show the UID number of NFC tags.
2. Screen can not show gif

What problem I met for Week 9 :

- 1.When connect MP3 player with light resistor circuit, it can not play
2. MP3 player will keep playing but won't stop
- 3.Button is not pressed, Microphone sensor keep led light.

How do I solve:

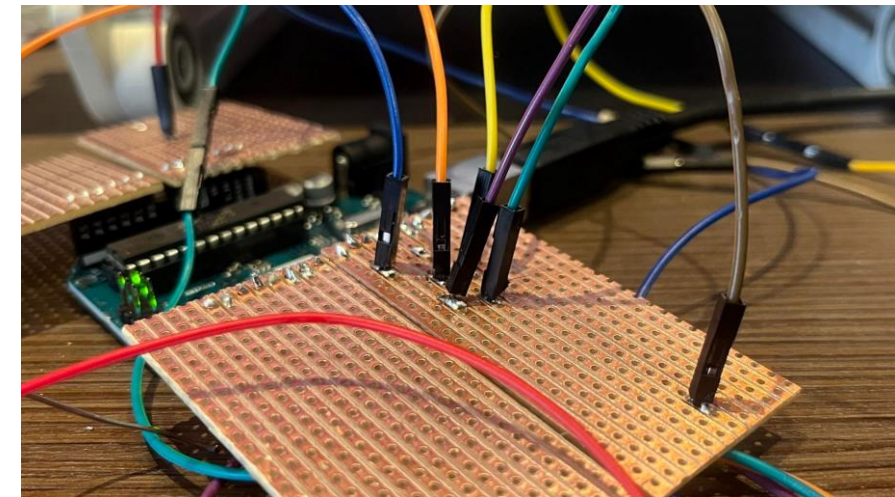
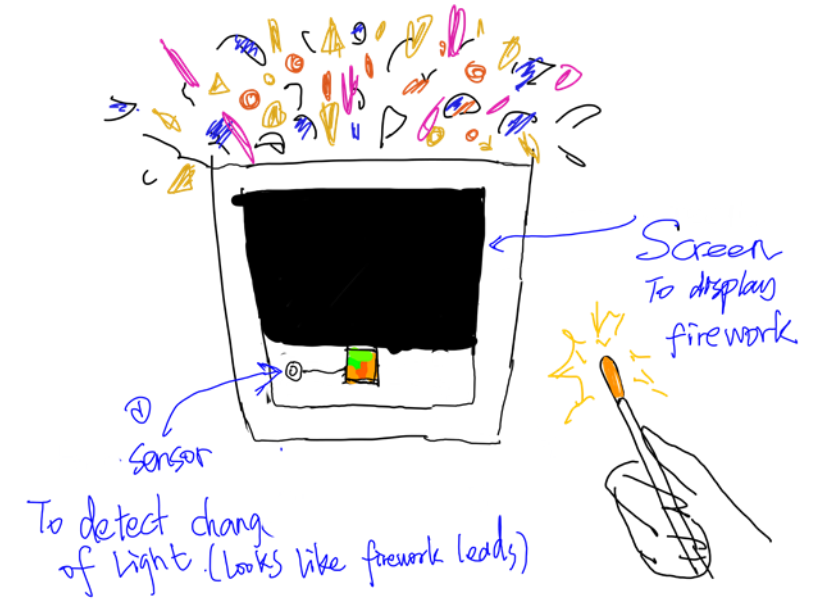
- 1.Change the former design plan from people hold the fake electrical match into audience hold the fake fire source and get closer to fireworks lead.

How do I solve:

- 1.Change the code.Find code can work for UNO R3.But it turned out to be the problem of soldering
- 2.Program pixels to form animation

How do I solve:

- 1.This problem shows because gnd line and vcc line of MP3 player is contacted. So use plastic cover to prevent
- 2.Use "while" and "if" statement
- 3.Use "switch" statement



This project still requires a lot of work to improve.

First is in the future, I want to change the way it shows fireworks from screen into projection because it looks more overwhelming.

Besides, I am going to change my animation programming so that fireworks can be more random.

Third, I am going to add more inputs such as ultrasonic sensor and color sensor to make it more interactive and more flexible. Finally, the size of installation should be reconsidered based on different using scenario.

In the future, it can be used both entertainment and a replacement of real fireworks to memorize people we care and release environment burden.

Future Possibility

Part one: Button and LED and Microphone sensor

Code reference:

<https://create.arduino.cc/projecthub/krivanja/working-with-an-led-and-a-push-button-71d8c1>
<https://www.jianshu.com/p/c06d7057edab>

Part two: RFID-522 and Strips

Code reference:

<https://forum.arduino.cc/t/rfid-mfrc522-h-wont-work-with-new-arduino-uno-wifi-rev2/560861>
<https://howtomechatronics.com/tutorials/arduino/how-to-control-ws2812b-individually-addressable-leds-using-arduino/>
<https://lingshunlab.com/book/arduino/arduino-uno-turn-on-ws2812b-color-leds>
<https://www.qutaojiao.com/24170.html>

Part three: Light controlled resistor and ST7735 and DF player

Code reference:

<http://programmermagazine.github.io/201401/htm/article1.html>
<https://www.electronics-lab.com/project/using-st7735-1-8-color-tft-display-arduino/>
<https://blog.jmaker.com.tw/arduino-st7735/>
https://blog.csdn.net/weixin_43031092/article/details/108712833
<https://sensorkit.joy-it.net/en/sensors/ky-037>
<https://electropeak.com/learn/interfacing-ky-037-sound-sensor-with-arduino/>
<https://circuitdigest.com/microcontroller-projects/interfacing-sound-sensor-with-arduino>
<https://www.arduino.cc/reference/en/language/structure/control-structure/switchcase/>

Final video link

<https://youtu.be/C87QbsllhBA>

Link towards Git hub which contain blog and code

<https://github.com/ZlqinGX/UAL--Advanced-Physical-Computing-portfolio-of-work.git>

Blog in Google slides:

<https://docs.google.com/presentation/d/1KdxvPymvaqiQX5y0VnkpLMqww9D4Unvbx4qmmSv8cF4/edit?usp=sharing>

Videos for testing:

Test coding of firworks for the first time:

<https://youtu.be/lmLY48aQbZg>

<https://youtu.be/dE99hSx0ZcE>

Test coding for MP3 player:

<https://youtu.be/kd95pXxf7gw>

Microphone sensor testing

<https://youtu.be/yWdwkDjdv20>

Test microphone sensor with LED:

https://youtu.be/vtuazbwwS_c

button-microphone-led test

https://youtu.be/NisM9_UwT3Q

RFID –LED strip

<https://youtu.be/ZMogIVy8eSl>