Creating Things That Think

-

Project 2

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September 29, 2021

IDEA 310L

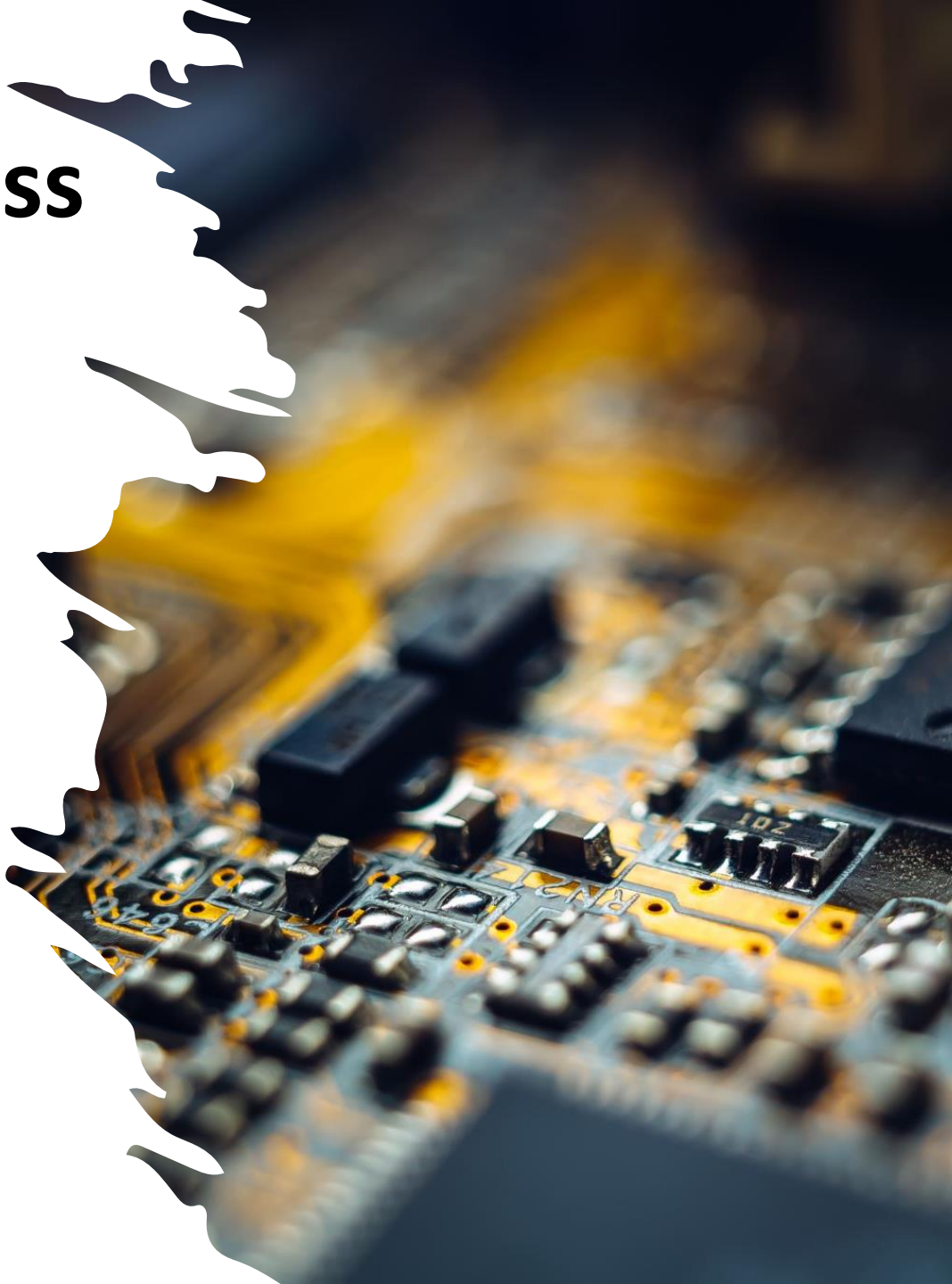
Description of Design Process

Design requirements :

- Two digital or analog inputs with at most one button/switch
- Using at least two digital outputs, using at most one LED

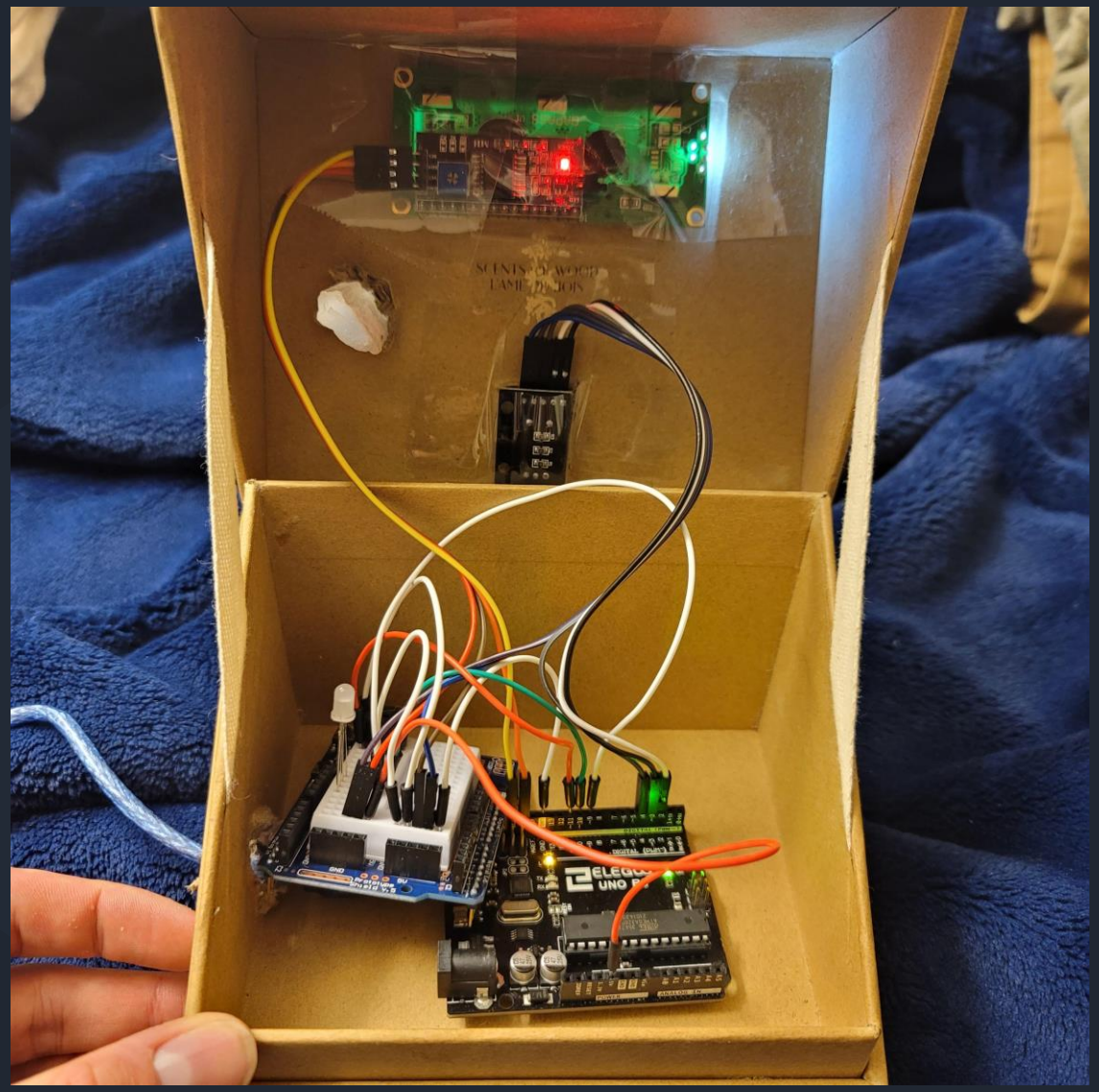
Design Process :

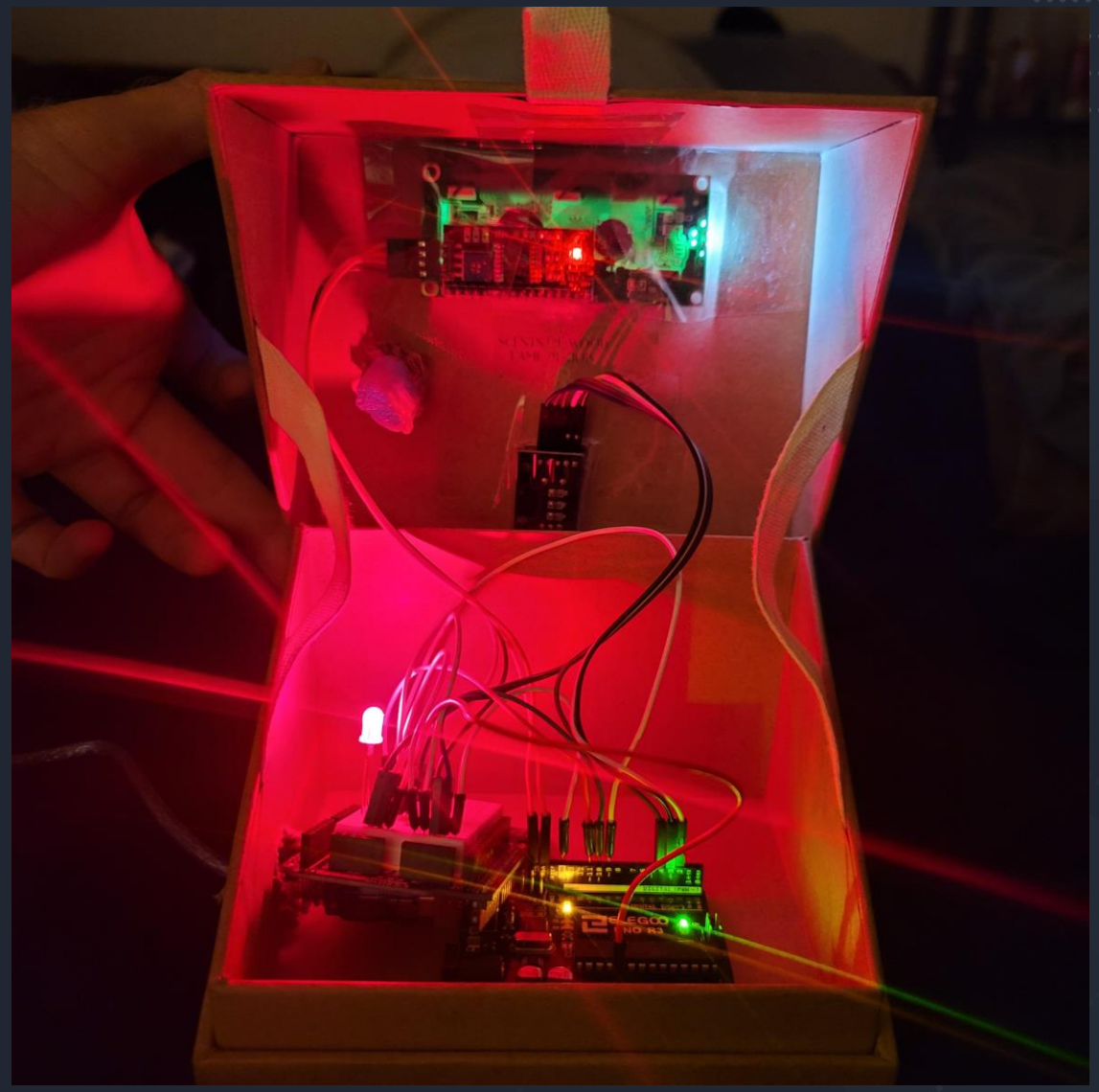
- Wanted to utilize the rotary encoder
  - Made me think of using a Masterlock
- Decided to design a ‘cracking the lock game’
  - Use the LCD screen to display information
- Needed some auditory feedback to simulate using a Masterlock
  - Utilized the piezoelectric transducer to simulate the ‘click’ of a turn
  - A different click is played when the target number is passed
- Use of Serial Input and Output for user interaction
  - User can set their own password or generate a random password to crack
- Alarm and light system for incorrect final guess
- Nice presentation



Design

Using a heavy-duty cardboard box with magnetic closure an LCD screen, Rotary Encoder, and Selenite crystal were embedded to create a fun presentation





When closed, the crystal sits above the LED and funnels the light outside of the box

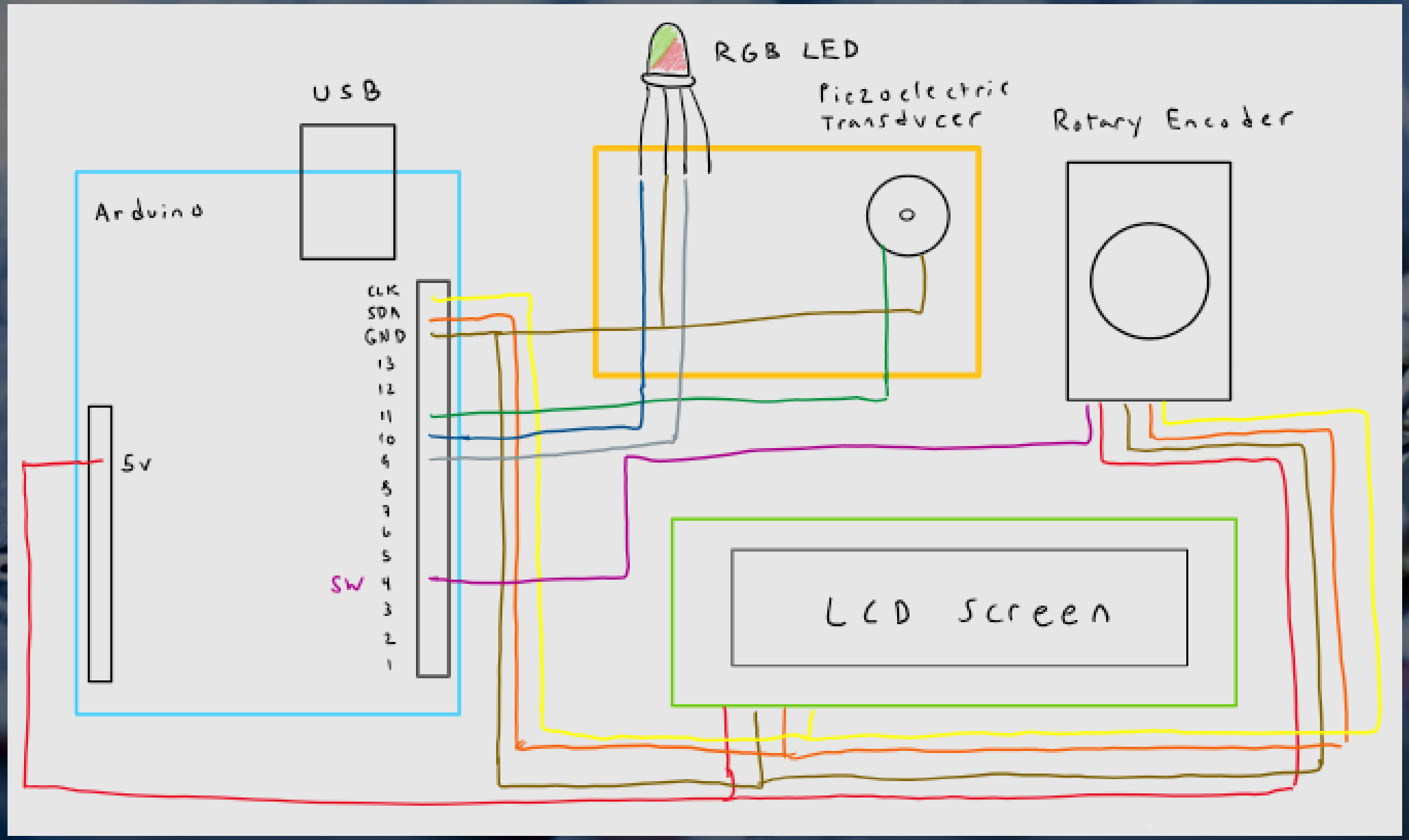
Description of Game

Crack the code game!

- You are attempting to crack into a device that contains sensitive cryptocurrency data.
- Have someone set a 3-digit password via the Serial Port or use the random function to generate one for you.
  - Input error checking is programmed in to ensure proper input format.
- Follow the on-screen instructions containing information on how to play.
  - Use the rotary encoder and listen for a variation in the sound of the clicks to identify the target number and press the switch to select the chosen number.
- Once the player has chosen all three numbers, the device will either accept or decline the password
  - On success, a green light will shine through the crystal and sensitive information will be displayed. WINNER!
  - On failure, a red light will shine through the crystal, an alarm will sound. FAILURE!

Schematic

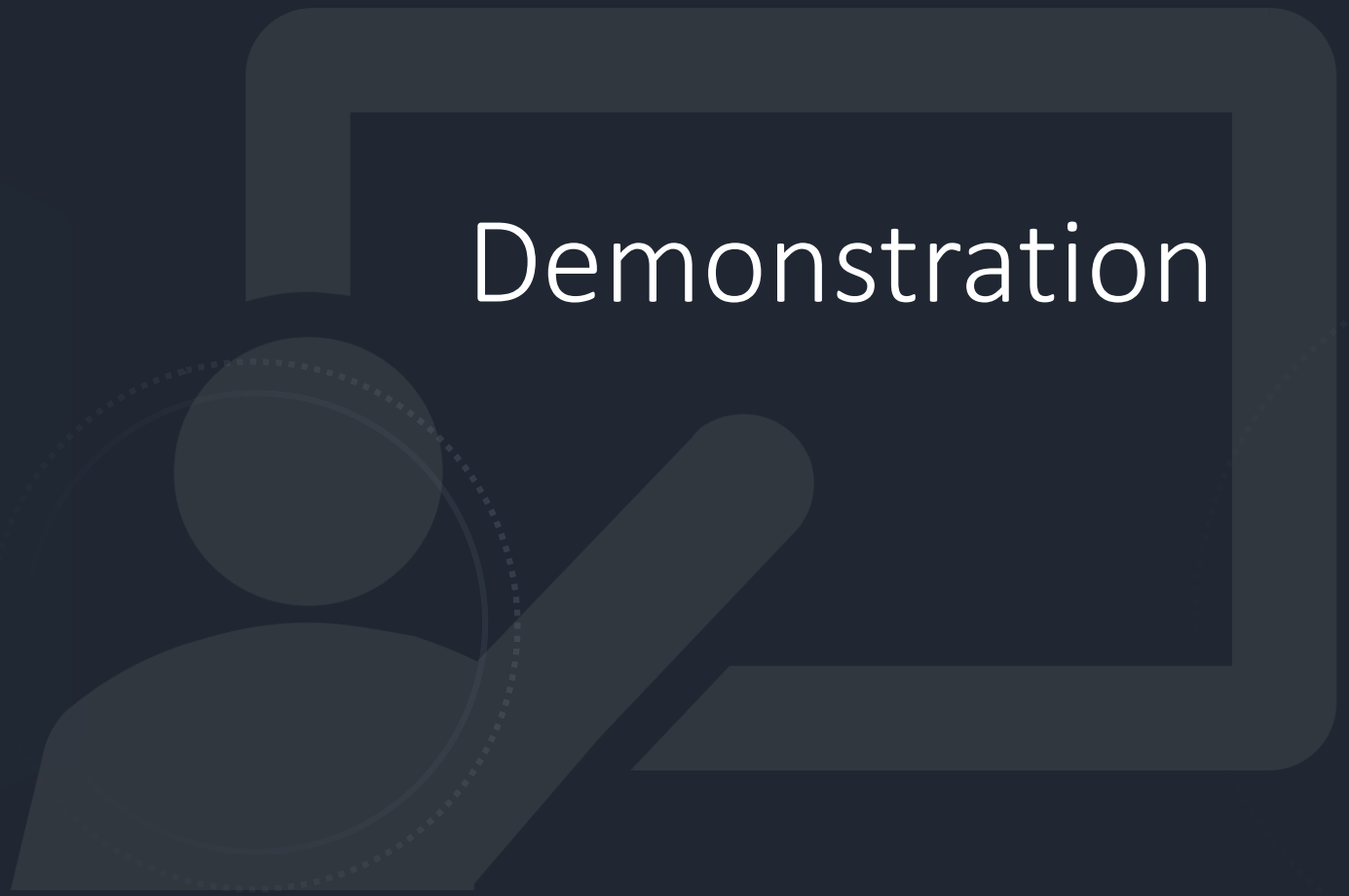
“Schematic”


RGB LED
USB
Piezoelectric Transducer
Rotary Encoder
Arduino
CLK
SDA
GND
13
12
11
10
9
8
7
6
5
SW 4
3
2
1
5v
LCD Screen

Schematic – Pin Layout

```
/*
 * Eric Martin
 * Project 2
 * Date: 09/29/2021
 * Class: IDEA 310L @ CSU
 *
 * Description:
 *
 *    A game where you use a rotary encoder to attempt to crack a lock by listening for a difference in sound
 *    in each rotational 'click' generated by a piezoelectric transducer. The display provides information,
 *    instructions, and if you are succesful, sensitive information! But beware, if you fail to crack the lock
 *    bad news is in store!
 *
 * Circuit:
 *
 * - Pin 11 : ohm piezoelectric transducer speaker
 * - Pin 10 : Green input for RBG LED
 * - Pin 9  : Red input for RGB LED
 * - Pin 4  : Rotary Encoder Switch
 * - Pin 3  : Rotary Encoder Clock
 * - Pin 2  : Rotary Encoder Data
 * - CLK    : LCD clock
 * - SDA    : LCD data
 * - 5V     : power for LCD and Rotary Encoder
 *
 */
```

Demonstration




irror_mod.use_x = True
irror_mod.use_y = False
irror_mod.use_z = False
operation == "MIRROR_Y":
irror_mod.use_x = False
irror_mod.use_y = True
irror_mod.use_z = False
operation == "MIRROR_Z":
irror_mod.use_x = False
irror_mod.use_y = False
irror_mod.use_z = True
selection at the end -add
_ob.select= 1
er_ob.select=1
ntext.scene.objects.activ
("Selected" + str(modifier
irror_ob.select = 0
bpy.context.selected_ob
ata.objects[one.name].se
int("please select exactly
OPERATOR CLASSES
types.Operator):
X mirror to the selected
ject.mirror_mirror_x"

Code

Code

```
void loop()
{
  // function to prompt user for password
 askForPass();

  // when characters arrive over the serial port verify password
 verifyPass();

  // promt user with new instructions now that pass is stored
 gameInstructions();

  // begin the game
 startGame();

  // run game over sequence
 endRoutine();

}
```

Code

```
// function to set RGB light
void RGB_color(int redVal, int greenVal){   // blue not needed. Saved a pin space
  analogWrite(LEDR, redVal);
  analogWrite(LEDG, greenVal);
}

// function to ask for password and display instructions
void askForPass(){
  if(!passEntered ){                    // if password isn't saved, prompt user
    while(Serial.available() == 0){     // if no serial input detected, loop
       lcd.setCursor(0,0);              // print on top line
       lcd.print("Bitcoin Safe");
       delay(3000);
       lcd.clear();
       lcd.setCursor(0,0);              // print on top line
       lcd.print("Enter Password:");
       lcd.setCursor(0,1);              // print on bottom line
       lcd.print("ex: 99 34 0");
       delay(3000);
       lcd.clear();
       lcd.setCursor(0,0);              // print on top line
       lcd.print("Enter Password:");
       lcd.setCursor(0,1);              // print on bottom line
       lcd.print("0 <= X < 100");
       delay(3000);
       lcd.clear();
       lcd.setCursor(0,0);              // print on top line
       lcd.print("Type 'random'");
       lcd.setCursor(0,1);              // print on bottom line
       lcd.print("for random pass");
       delay(4000);
       lcd.clear();
    }
  }
}
```

```
void startGame(){
  if(!gameOver){
    lcd.setCursor(0,0);
    lcd.print("Position: ");

    while(!gameOver){
      RotaryState = digitalRead(RotaryCLK); // Read CLK
      // If CLK changed, that means a Pulse has occurred
      if ((RotaryState != RotaryLastState) && RotaryState){
        // If RotaryDT is different => clockwise
        if (digitalRead(RotaryDT) != RotaryState) {
          if(Rotarycounter < 99){
              if((currGuessNum == 0) && (Rotarycounter == (passNum1))){
                tone(11, 466 , 20);
                Rotarycounter ++;
              }else if((currGuessNum == 1) && (Rotarycounter == passNum2)){
                Rotarycounter ++;
                tone(11, 466 , 20);
              }else if((currGuessNum == 2) && (Rotarycounter == passNum3)){
                Rotarycounter ++;
                tone(11, 466 , 20);
              }else{
                tone(11, NOTE_C4 , 2);
                Rotarycounter ++;

              }
          }
```

e

Challenges / Issues

- Parsing the user input string into 3 integers was proving difficult
  - The game only works on random mode as of now
- Screen text must fully cycle through loop before user input is read
  - This makes for some wait time after user input
- I could not get the target number to cause a unique ‘click’ when you turn to the number
  - The unique ‘click’ sound will only occur once you pass the number in either direction.
- Rotary Encoder could be better secured into box