Creative Electronics

Mini Project: a secret knock to open your box

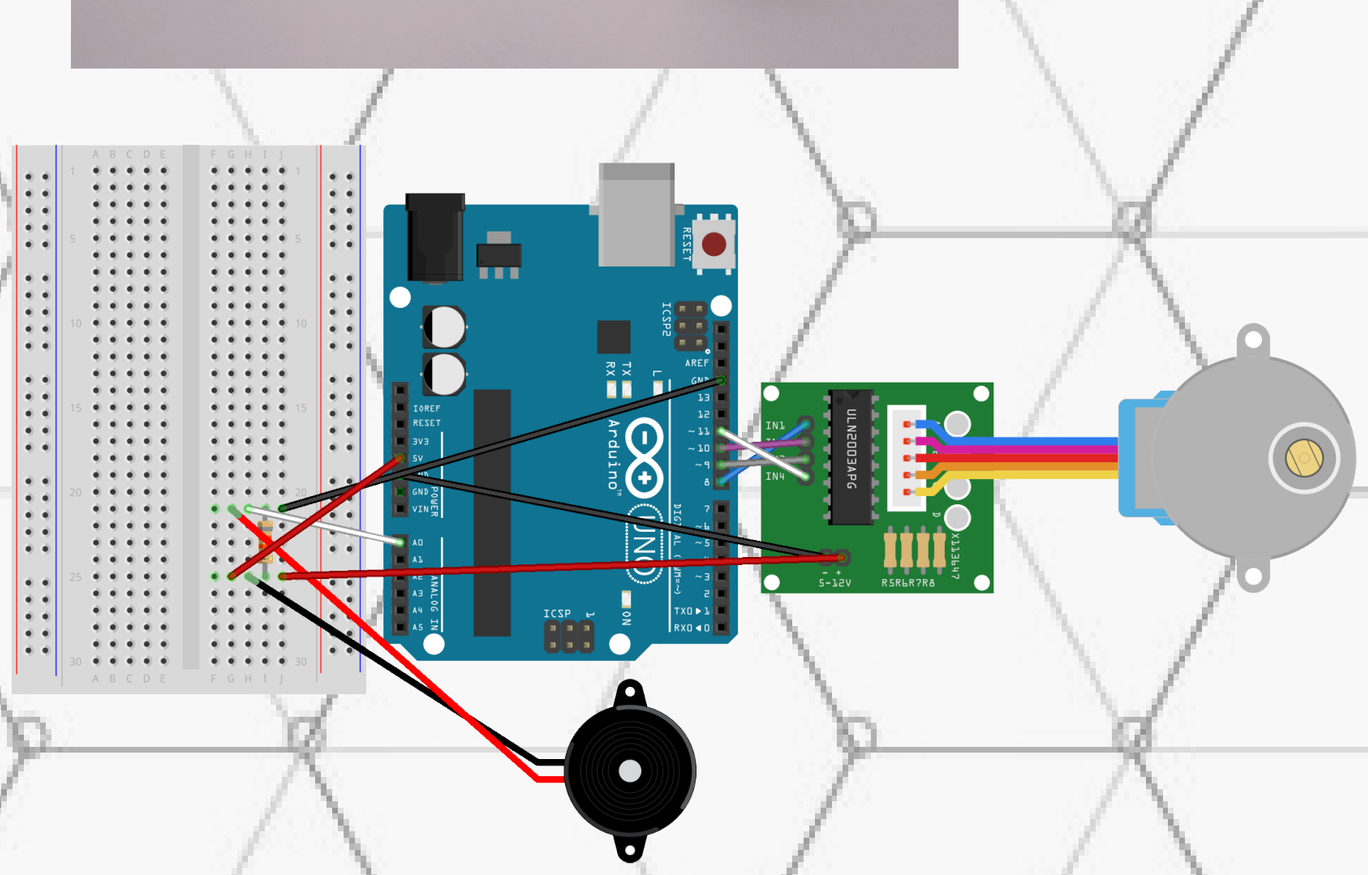
By Elvis Dubra and Michelle Vossen

Explanation

We have designed a jewelry box that opens with a secret knock. Using an Arduino, step motor and piezoelectric sensor we have made the side of the pressure sensitive. When knocking in the right order, the box will open and reveal its secrets for a short amount of time.

To open this box, you have to knock three times on the left side of the box. Only if you figure out the right timing of the knocks, you can have a peek inside.

Every time the secret knock is executed correctly, the box will open for five seconds. If only the first one or two knocks are executed correctly, the program will see it as an error, so you will have to do it from the start.



Code

We chose a relatively short knocking sequence for our box. We did this, because even with the margins for the knocks seeming generous, it still turned out to be quite hard to do it right. This way, it remains possible for the owner of the box to open it easily, but for anyone else who might want to have a look inside the box it's not. To add security, we let the box close automatically after five seconds.

To create the knocking sequence, we used multiple if, else if and else statements embedded in and following each other. If you knock for the first time, it prints 'Knock 1'. For the second time, depending on whether or not you knocked within the right time span, it either prints 'Knock 2' or it goes back to zero knocks. If you do it right after the second knock, it prints 'Knock 3, Open!' and the motor starts moving, opening the box.

```
/* Code by Michelle Vossen and Elvis Dubra
A secret knock that opens a box full of secrets
Special thanks to pretty much all of the student assistants
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#include <Stepper.h>
#define STEPS_PER_MOTOR_REVOLUTION 32
#define STEPS_PER_OUTPUT_REVOLUTION 32 * 64  //2048
Stepper small_stepper(STEPS_PER_MOTOR_REVOLUTION, 8, 10, 9, 11);

// Variables
unsigned long currenttime = 0;
int amountofknocks = 0;
int  stepstaken;
int ledPin = 13;
int knockSensor = 0;
int inputPiezo = 0;
int statePin = LOW;
int threshold = 250;

void setup() {
  Serial.begin(9600);
}

void loop() {
  //Serial.println(analogRead(A0));
  inputPiezo = analogRead(knockSensor);
  //Serial.println(inputPiezo);
  if (inputPiezo <= threshold) {
    if (amountofknocks == 0) {
      currenttime = millis();
      amountofknocks++;
      Serial.println("Knock 1");
    }
    else if (amountofknocks == 1) {
      Serial.println(millis());
      Serial.println(currenttime);
      if ((millis() > (currenttime + 300)) && (millis() < (currenttime + 1500))) {
        amountofknocks++;
        currenttime = millis();
        Serial.println("Knock 2");
      }
      else {
        amountofknocks = 0;
      }
    }

    else if (amountofknocks == 2) {
      Serial.println(millis());
      Serial.println(currenttime);
      if ((millis() > (currenttime + 1700)) && (millis() < (currenttime + 5000))) {
        statePin = !statePin;
        digitalWrite(ledPin, statePin);
        Serial.println("Knock 3, Open!");   // After the third correct knock, the door

        stepstaken  =  STEPS_PER_OUTPUT_REVOLUTION / 4 ;
        small_stepper.setSpeed(500);
        small_stepper.step(stepstaken);
        delay(5000);    // You have 5 seconds to get your stuff out of the box

        stepstaken  =  - STEPS_PER_OUTPUT_REVOLUTION / 4;
        small_stepper.setSpeed(700);
        small_stepper.step(stepstaken);

        delay(150);
        amountofknocks = 0;
        currenttime = millis();
      }
      else {
        amountofknocks = 0;
      }
    }
    while (analogRead(knockSensor) < 1000) {}
    delay(100);
  }
}
```