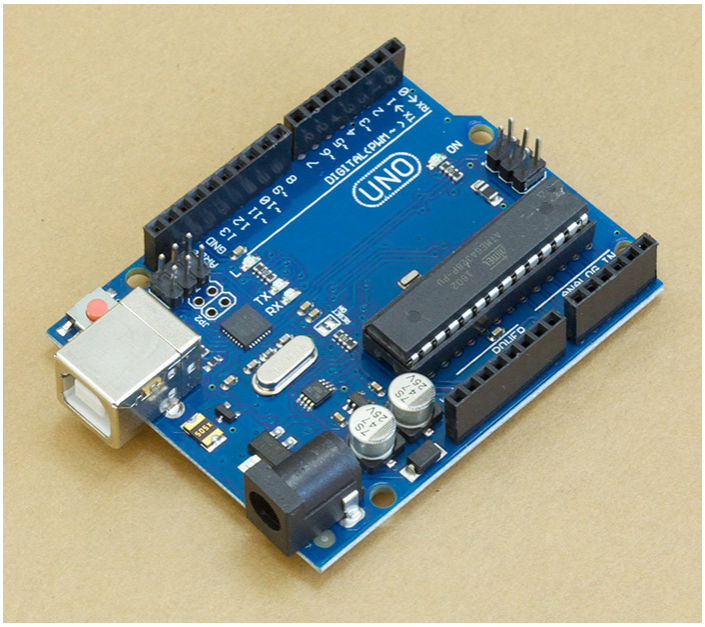
Mini Stool Bot

by

Rachel Ann Timtiman

Repository
https://github.com/Anntimti/CART360/tree/master/ASSIGNMENTS/ASSIGNMENT_THEN

Materials



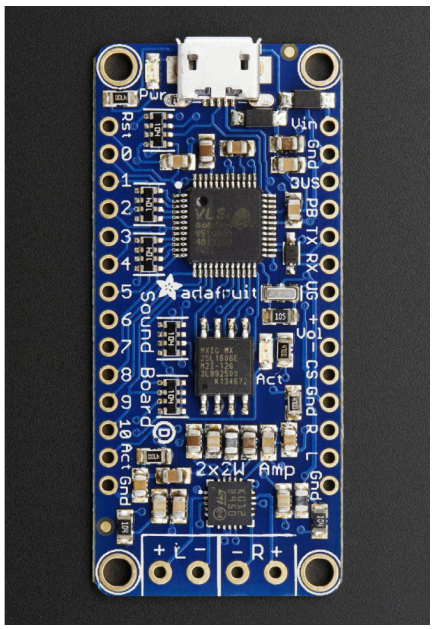
UNO
ATmega328 microcontroller
Input voltage - 7-12V
14 Digital I/O Pins (6 PWM outputs)
6 Analog Inputs
32k Flash Memory
16Mhz Clock Speed

https://www.spikenzielabs.com/Catalog/arduino/boards/uno-r3-compatible

SENSOR: HC-SR04 ULTRASONIC RANGING MODULE - 4 PIN

Working Voltage : 5V(DC)
Working Current : max 15mA
Working frequency : 40HZ
Output Signal : 0-5V (Output high when obstacle in range)
Sentry Angle : max 15 degree
Sentry Distance : 2cm - 450cm

Using the 2 circles as the eye of the stool make it more alive.



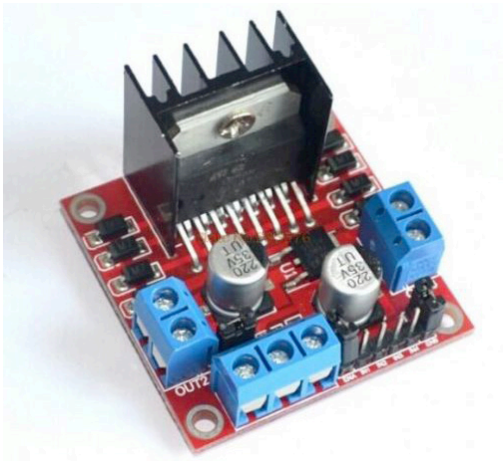
SOUND BOARD + 2x2W Amp
Working Voltage : 3 to 5.5VDC battery
Storage: 16MB

https://www.spikenzielabs.com/Catalog/adafruit/wearable-supplies/adafruit-audio-fx-sound-board

Giving a voice to the stool to make it more alive.

BUNDLE WHEEL
https://www.spikenzielabs.com/Catalog/robotics-cnc/dc-motors/geared-dc-motor-and-wheel-bundle

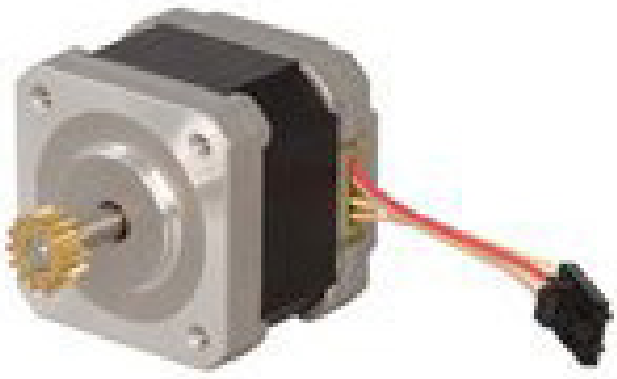
L298N DUAL MOTOR Controller Modules and Arduino



Logic VCC: 5v
Drive VCC: 5v – 35v
Drive current: 2A (MAX)
Storage Temperature: -20˚C to +135˚C
Power: 25W (Max)

https://abra-electronics.com/electromechanical/motors/motor-controllers/mot-l298-l298n-dual-h-bridge-dc-controller-board.html

STEPPER MOTOR
Ball bearings
Dielectric strength: 500V, 50Hz/minute
Insulation resistance: 100MΩ @ 500 VDC
1.8" lead wires
Drive system: Bipolar
Rated Voltage: 12VDC



Phase resistance: 1.55 Ω
Current: 1700mA

https://www.jameco.com/z/STP-42D201-37-Shinano-Kenshi-12-Volt-1-8-Step-Angle-Bipolar-Stepper-Motor_2158531.html

Surface Transducer - Large

4 ohm nominal

It gives a voice to the stool.

NEOPIXEL 1/4 60 RING -15 RGB LED
Each one has ~18mA
5VDC

https://www.adafruit.com/product/1768

It gives a friendly characteristic to the stool

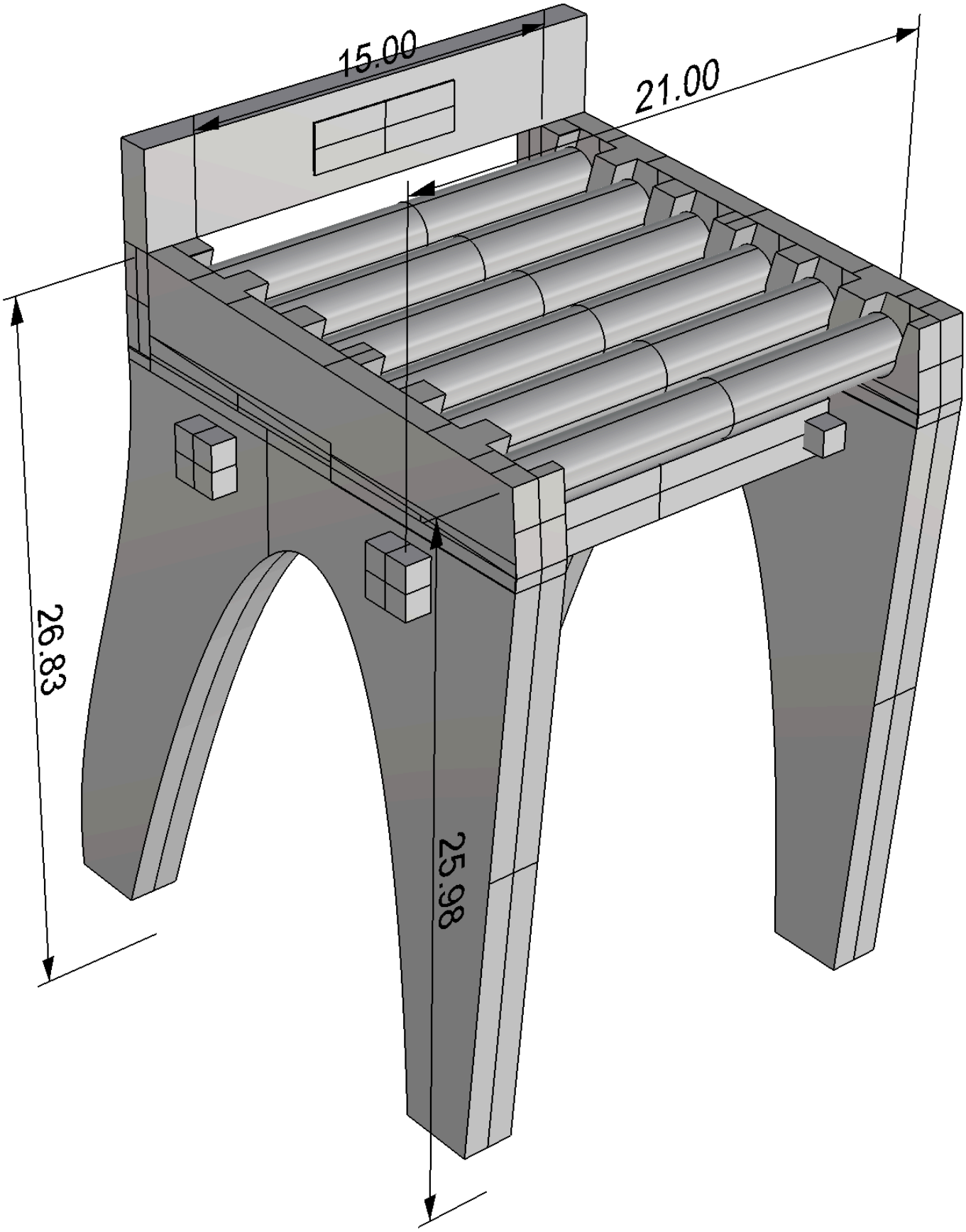
TRANSPARENT BASE
To be mix with the thermochromic pigment.

THERMOCHROMIC PIGMENT
To be mix with the transparent base.

The pigment reacts to the heat and the cold.
When the pigment is heated, it changes to transparent
When it's cooled it turns back to its pigment color

DESIGN & BUILD

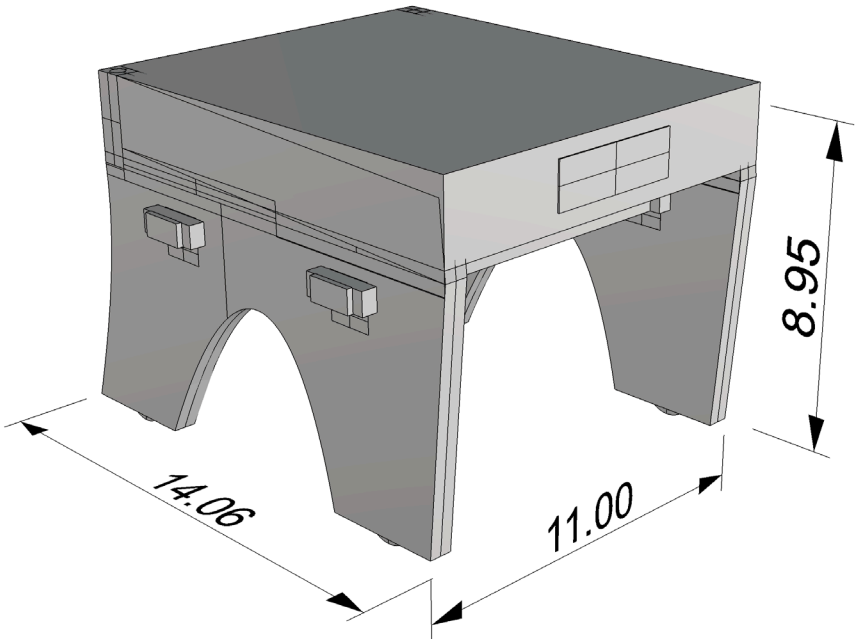
1st iteration of the chair



2rd iteration of the chair

Japanese Stool

My idea is still the same but in a small scale. The change is when the person put the box, the box light up as it's brain
(neuron brain (reed switch and round neopixel led))



Design description & Concept

The premise is based on making the user healthier by assembling the stool and interacting with it. It is based on research of how people tend to sit for a longer period of time and don't move after settling down.

This project aims to make the user realize how to be more active by making the stool have its own emotions.

Here is what inspired the project. This project allowed us to experiment with the following technologies: Black thermochromic pigment, sound-board, HC-SR04 Ultrasonic, a large surface transducer, neopixel of 15 LED, conductive copper tape, wheel bundle, 12 volt battery, stepper motors, motor controllers l298-l298n and Arduino Uno.

The assembly allowed me to use the CNC machine, a transparent base for the black thermochromic pigment, engraved plexiglass and cut with the laser machine.

The final product is in the form a small stool.

CHANGE CAN BE:
Movement
Lights
Visual
Sound

NAME: Mini Stool Bot

BRAINSTORMING SENSOR:

Danger
Yield
Hiss
I win
SHRTPURR

What is the story behind your design?

When someone wants to sit down, they will have to build the stool. Once the stool has been built, the stool runs away if they get close to it. If the person goes too the mode danger the stool will slowly run at the person because it got to it's limit of 2 warning.

Where does it come from?
I was inspired by seeing my boyfriend sitting down after a long day at work sitting and not moving.

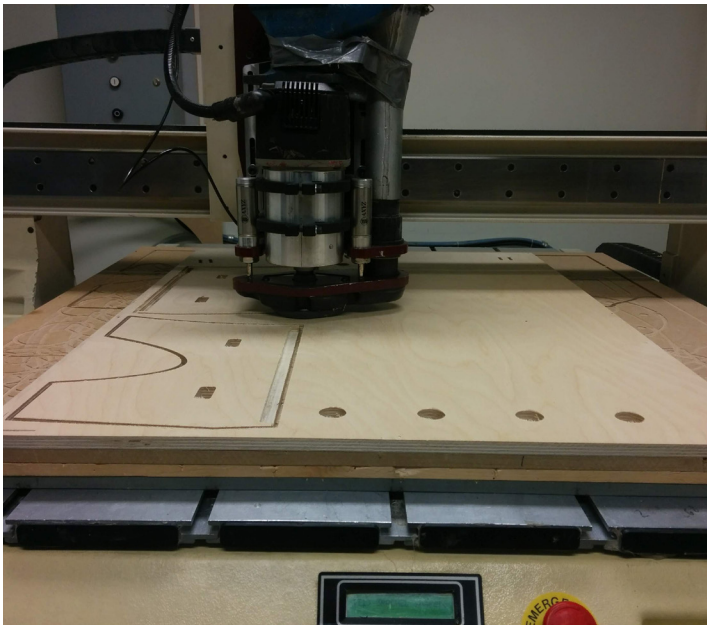
Why does it exist?
To make people move and live a healthier lifestyle.

What is the personality of your design?
angry
happy
overwhelmed

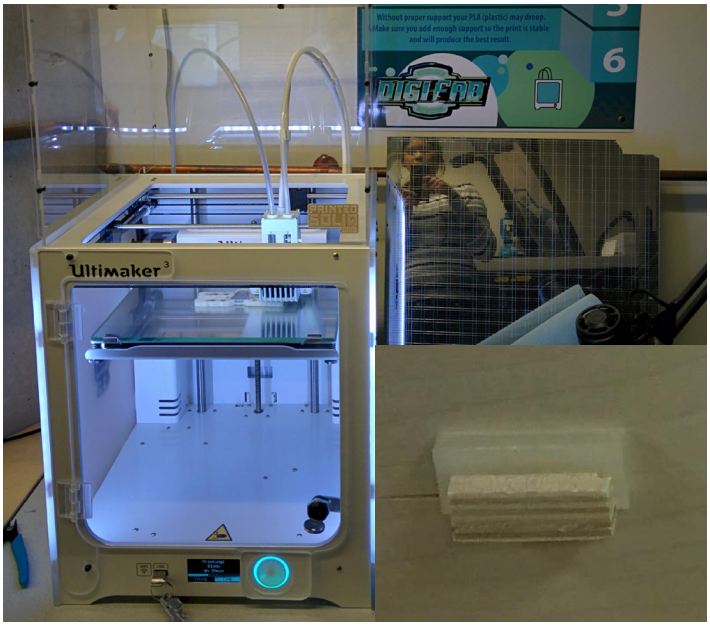
How does its personality manifest itself in the physical world?
By a smiling light that changes colors depending on the distance you are interacting with the stool.
It moves away and runs at you depending on the distance you are at.
It also makes a happy sound when you're far away and an angry sound when you're too close to it.

What makes your design do what it does?
A proximity sensor that detects the distance of the user and soundboard.
When you get close to it, it talks to you, lights up and moves.
When you touch it, the thermochromic ink changes colors as we've seen with human skin when you touch it.

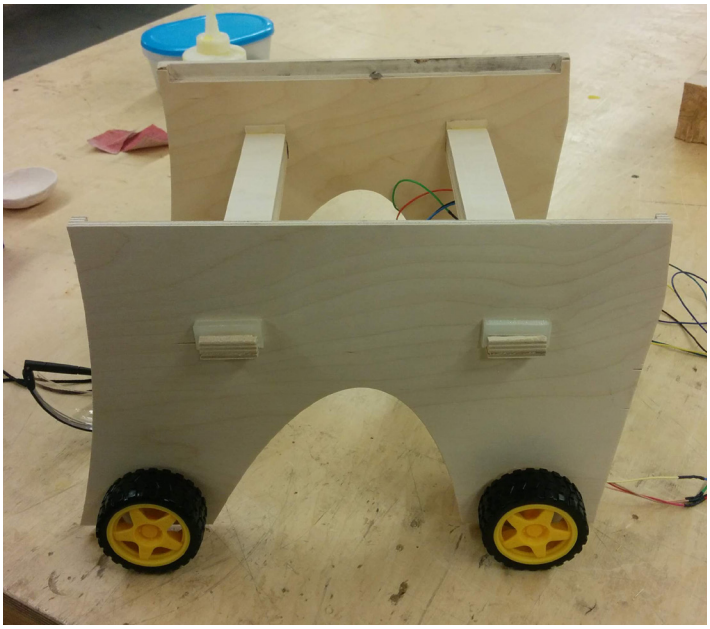
BUILDING PROCESS



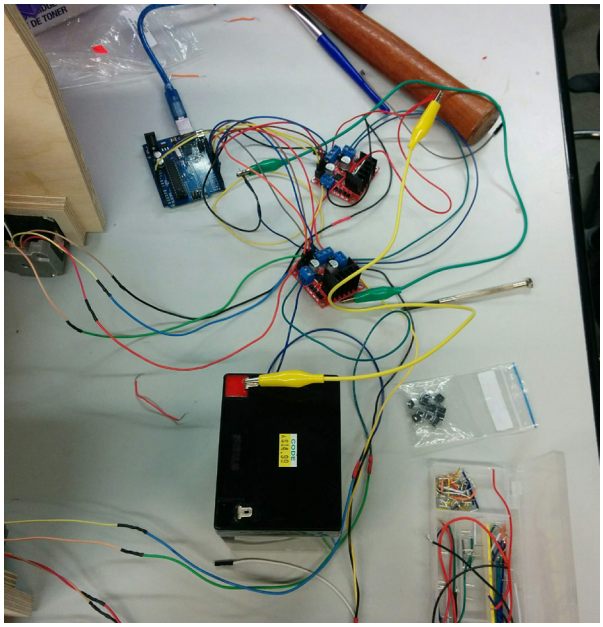
CNC. Cutting the plywood



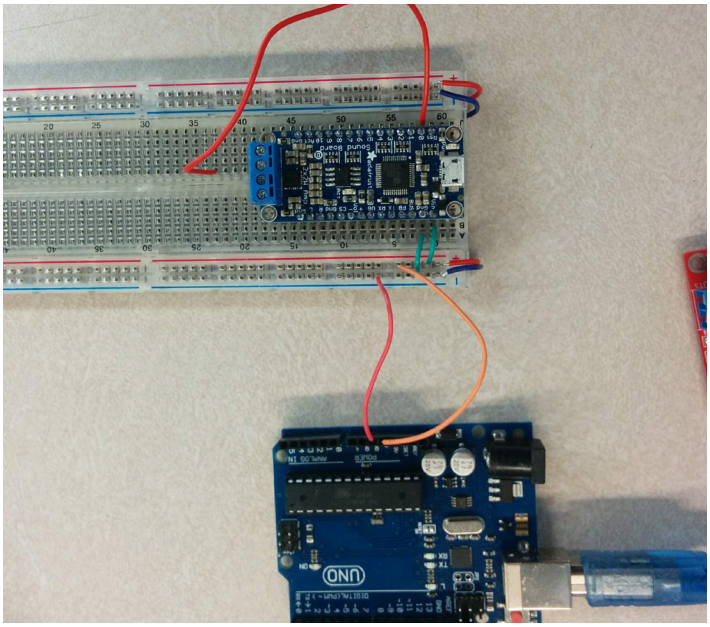
Ultimaker 3
3D printing the lock for the stool



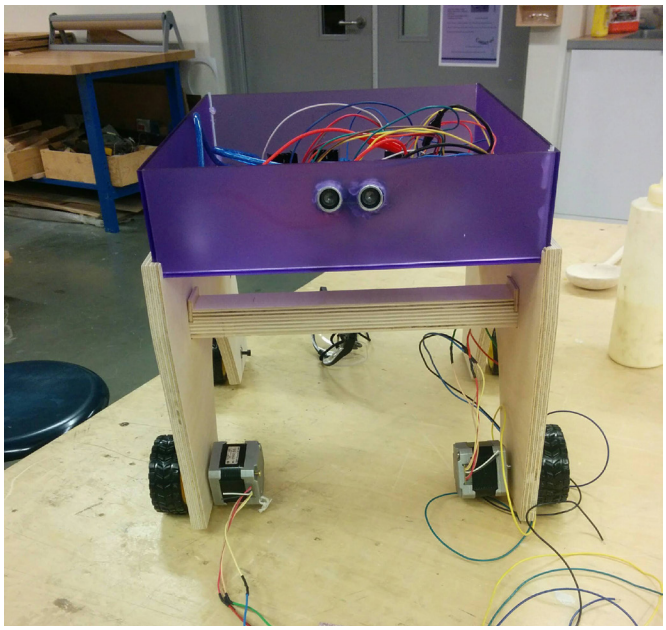
Making holes for the wheel



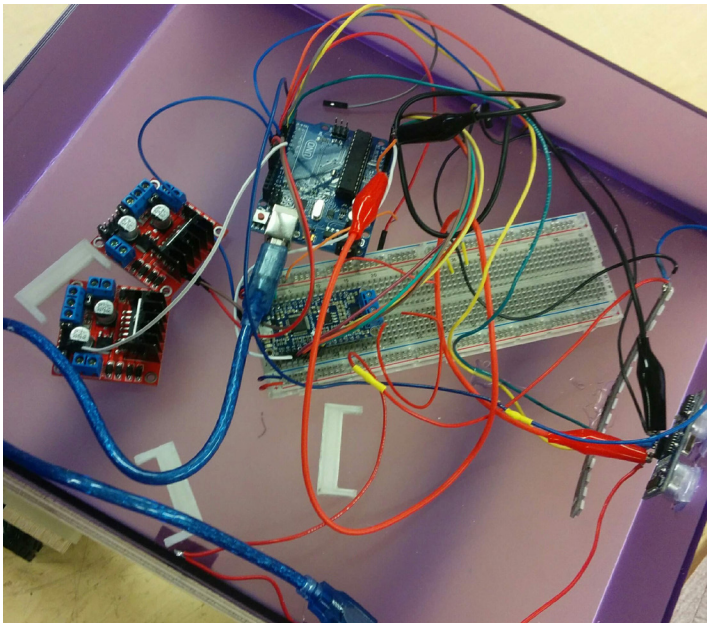
Testing the stepper motor with L298N Dual Motor Controller Modules and Arduino with 12V power



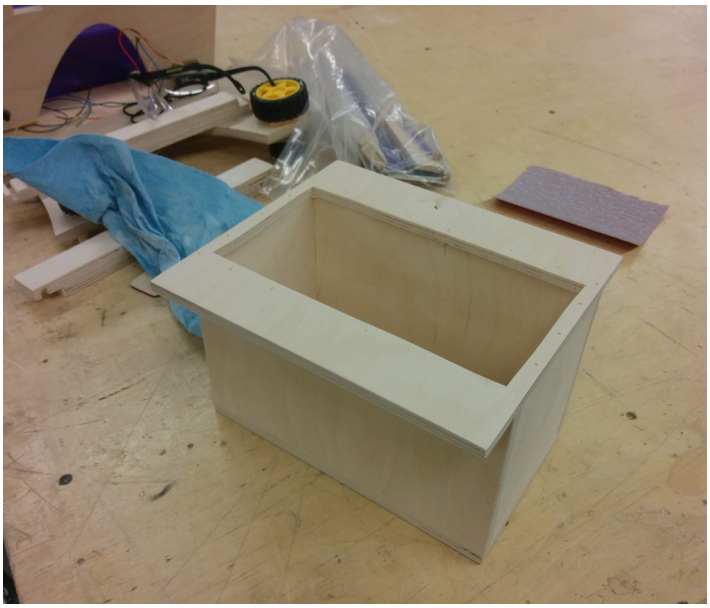
Testing sound board



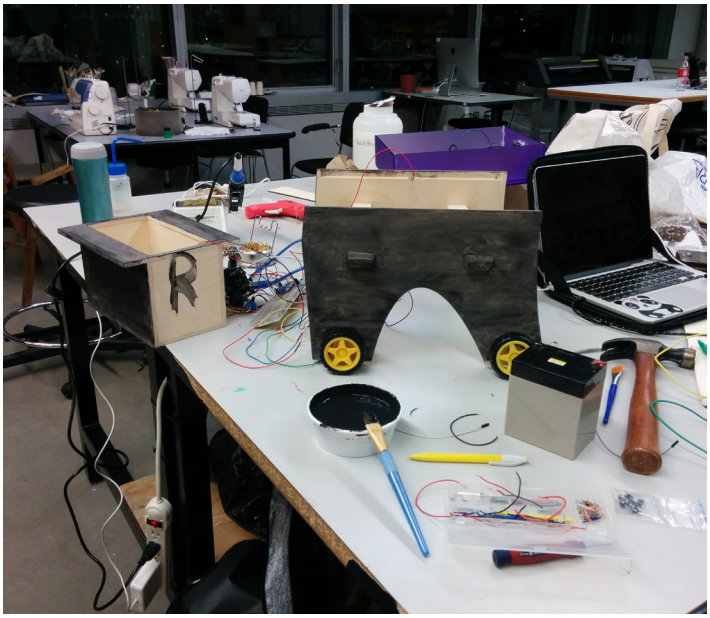
Made some holes for the sensor to be like a pair of eyes



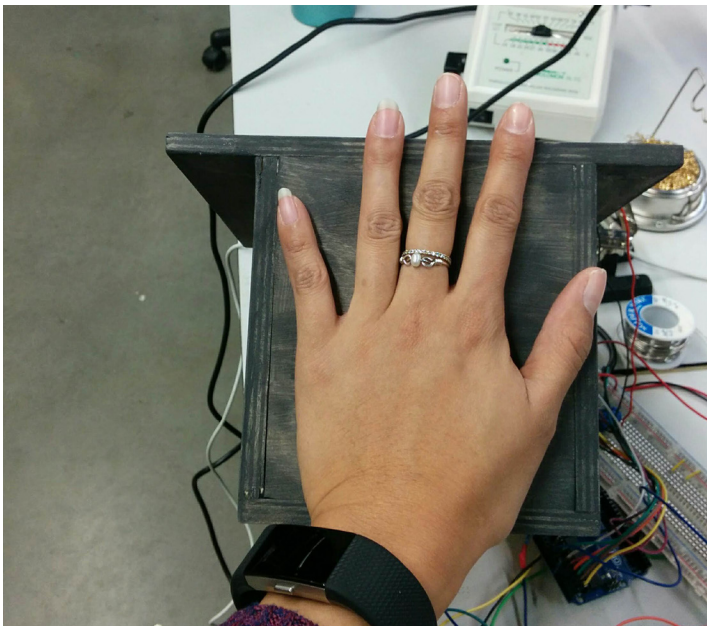
All electronics are still in the box.



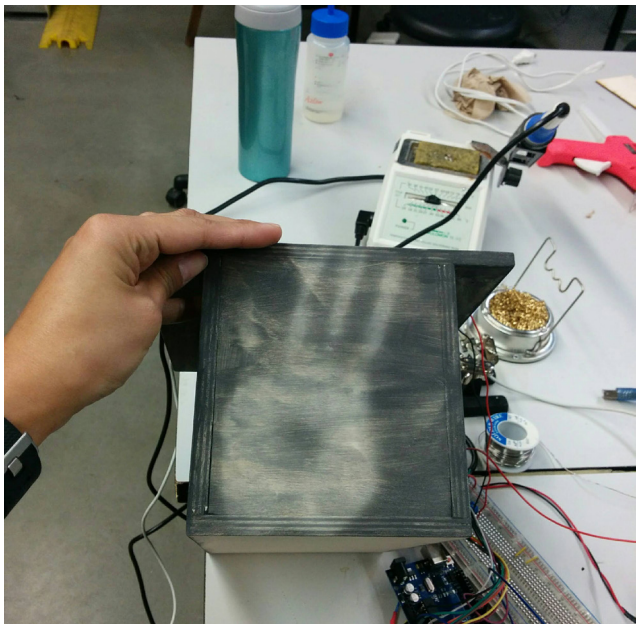
Made a box for Arduino and baterry to sit in.



Thermochromic paint.

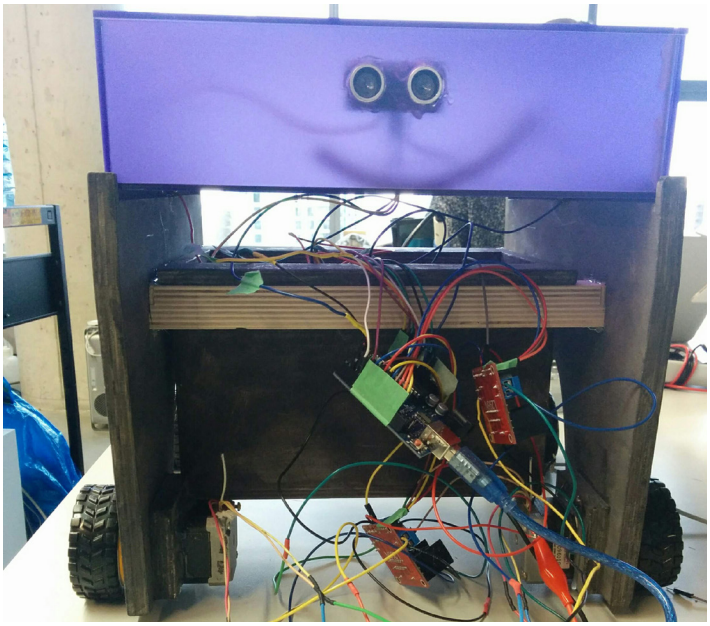


Heating up the wood.



A trance of scar or is it a trace of memories on the stool?

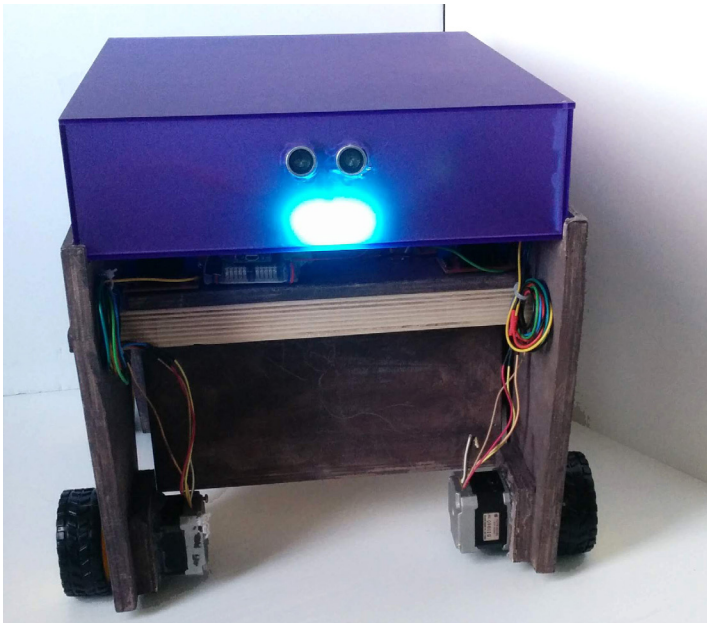
This gives the stool a human skin for example when you touch someone for a long time, his or her skin pigment changes

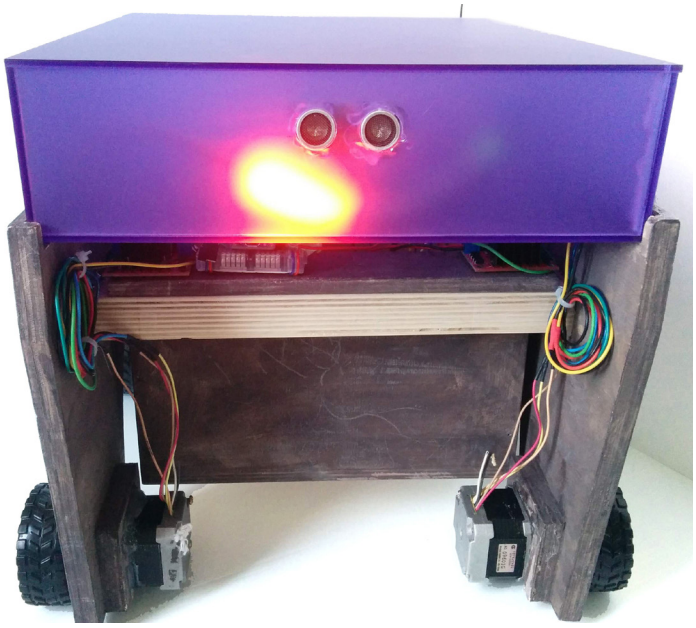


Connected the power brain so it can be independent. Therefore, when the pins of the sensor and light are connected the head scream for its brain which is the sitting plexiglass.

4.0 project.

The stool will have legs so it can kick the person when it's in danger mood.





Using a neopixels for the lips of the stool.

This shows 5 colors of actions from the stool.

Color(250,0,0) pure red: saying DANGER

Color(0, 255, 0) pure green: Asking the person to YIELD

Color(0, 90, 100) blue: Scaring the person with HISS-ING sound

Color(60,90,100) turqoise: Telling the user that the stool won from the human to stay in that distance

Color(100, 10, 128) purple: The stool is for PURRING cat sound to say it's happy.

DANGER copy.wav

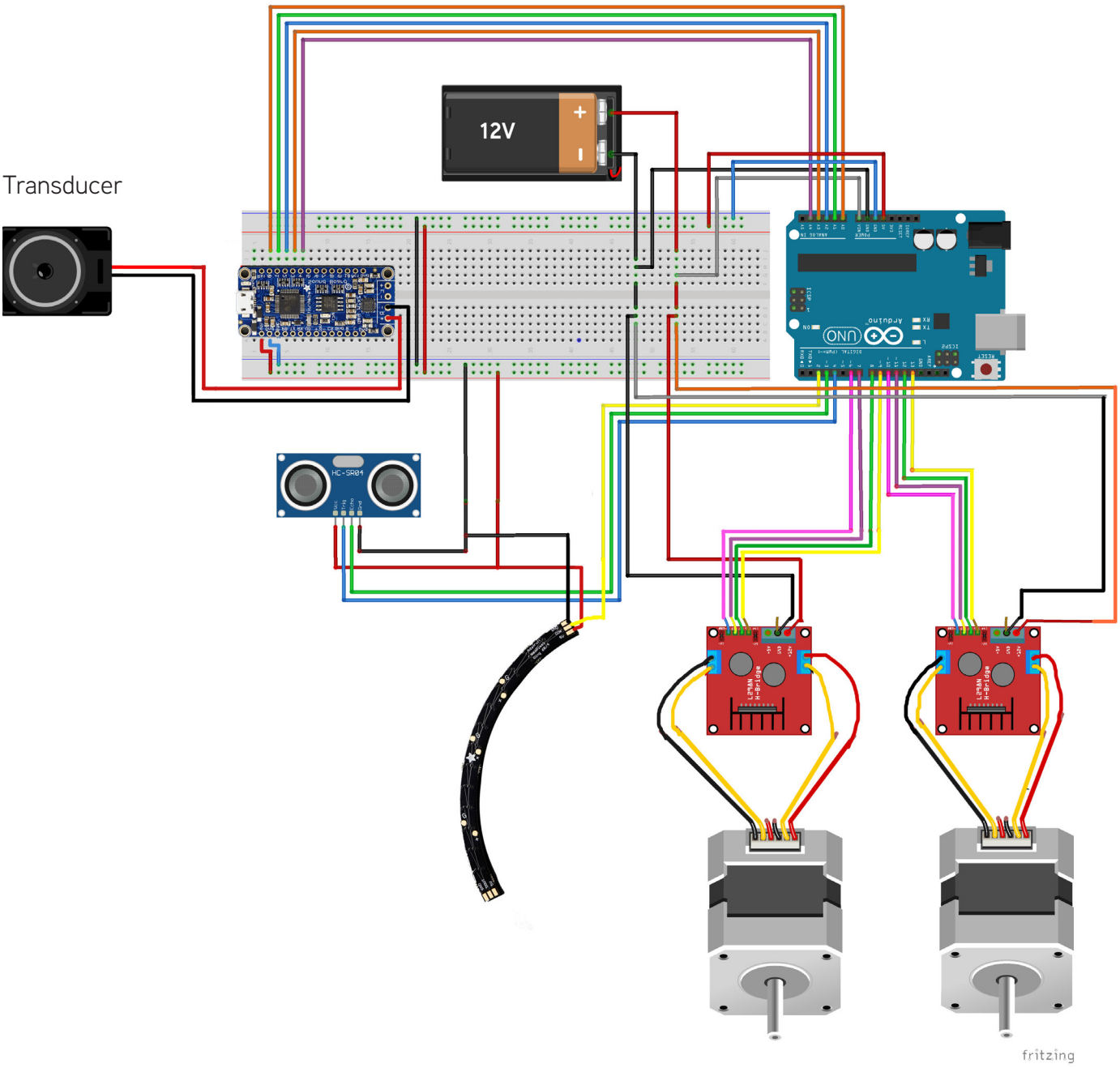
YIELD copy.wav

HISS copy.wav

I WIN copy.wav

SHRTPURR.wav

Schematic of the electronics of Stool



Code Sensor and Light

```
/*
 * created by Rui Santos, https://randomnerdtutorials.com
 *
 * Complete Guide for Ultrasonic Sensor HC-SR04
 *
    Ultrasonic sensor Pins:
        VCC: +5VDC
        Trig : Trigger (INPUT) - Pin11
        Echo: Echo (OUTPUT) - Pin 12
        GND: GND
 */
#include <Adafruit_NeoPixel.h>

#define PIN      2
#define N_LEDS 15
Adafruit_NeoPixel strip = Adafruit_NeoPixel(N_LEDS, PIN, NEO_GRB + NEO_KHZ800


int trigPin = 4;    // Trigger
int echoPin = 3;    // Echo
long duration, cm, inches;
#define ACT 5
boolean control_sound = false;

void setup() {
  //Serial Port begin
  Serial.begin (9600);
  //Define inputs and outputs
  pinMode(trigPin, OUTPUT);
  pinMode(echoPin, INPUT);


// SOUND
  pinMode(14, OUTPUT);
  pinMode(15, OUTPUT);
  pinMode(16, OUTPUT);
  pinMode(17, OUTPUT);
  pinMode(18, OUTPUT);
  pinMode(ACT, INPUT_PULLUP);

 digitalWrite(14, HIGH);
  digitalWrite(15, HIGH);
 digitalWrite(16, HIGH);
 digitalWrite(17, HIGH);
 digitalWrite(18, HIGH);
```

```
    strip.begin();
}

int getDistance() {
  // The sensor is triggered by a HIGH pulse of 10 or more microseconds.
  // Give a short LOW pulse beforehand to ensure a clean HIGH pulse:
  digitalWrite(trigPin, LOW);
  delayMicroseconds(5);
  digitalWrite(trigPin, HIGH);
  delayMicroseconds(10);
  digitalWrite(trigPin, LOW);

  // Read the signal from the sensor: a HIGH pulse whose
  // duration is the time (in microseconds) from the sending
  // of the ping to the reception of its echo off of an object.
  pinMode(echoPin, INPUT);
  duration = pulseIn(echoPin, HIGH);

  // Convert the time into a distance
  //cm = (duration/2) / 29.1;     // Divide by 29.1 or multiply by 0.0343
  return inches = (duration/2) / 74;   // Divide by 74 or multiply by 0.0135

//  Serial.print(inches);
//  Serial.print("in, ");
//  Serial.print(cm);
//  Serial.print("cm");
//  Serial.println();
}

static void chase(uint32_t c, int t) {
  for(uint16_t i=0; i<strip.numPixels()+4; i++) {
      strip.setPixelColor(i   , c); // Draw new pixel
      strip.setPixelColor(i-4, 0); // Erase pixel a few steps back
      strip.show();
      delay(t);
  }
}

void determineState(int d) {
  int play = -1;

  if(d < 15) {
    chase(strip.Color(255, 0, 0), 5);
    //delay(1000);
    digitalWrite(14, LOW);
```

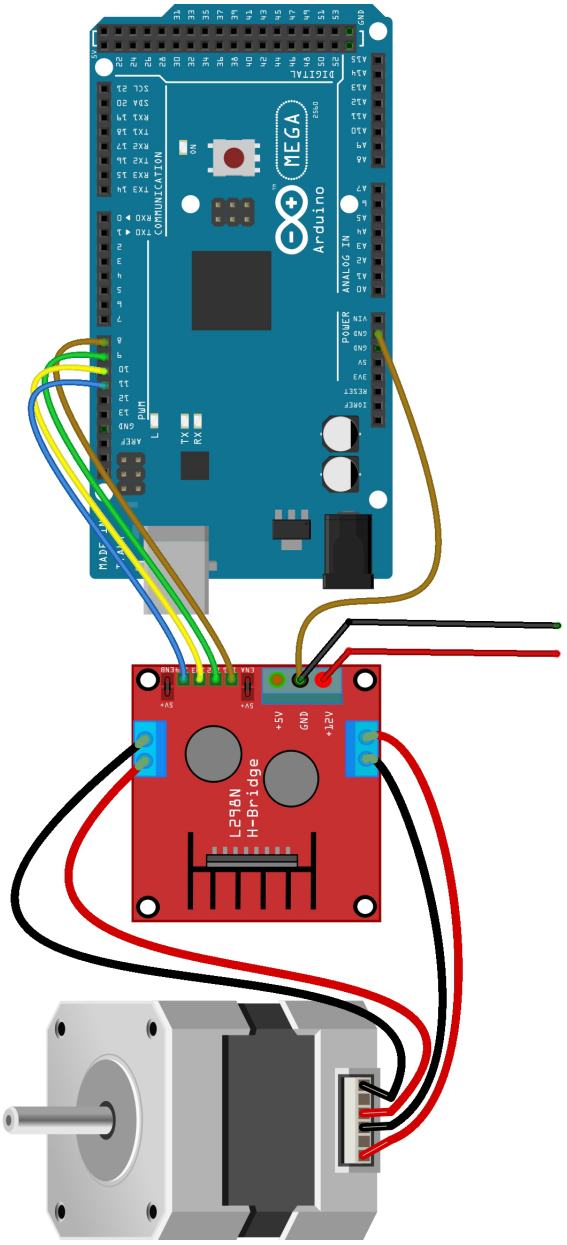
```
  } else
    digitalWrite(14, HIGH);

  if((d > 15) && (d < 30))  { chase(strip.Color(0, 255, 0), 15);
digitalWrite(15, LOW);  } else digitalWrite(15, HIGH);
  if((d > 30) && (d < 50))  { chase(strip.Color(0, 90, 100), 30);
digitalWrite(16, LOW);  } else digitalWrite(16, HIGH);
  if((d > 50) && (d < 80))  { chase(strip.Color(60, 90, 100), 45);
digitalWrite(17, LOW); } else digitalWrite(17, HIGH);
  if((d > 80) && (d < 100)) { chase(strip.Color(100, 10, 128), 100);
digitalWrite(18, LOW); } else digitalWrite(18, HIGH);
  if(d > 150) Serial.println("FAR");
//
//    while(digitalRead(ACT) == LOW) {
//      delay(1500);
//   }


  //digitalWrite(play, HIGH);
  //digitalWrite(14, HIGH);
//  digitalWrite(15, HIGH);
//  digitalWrite(16, HIGH);
//  digitalWrite(17, HIGH);
//  digitalWrite(18, HIGH);
}


void loop() {
  determineState(getDistance());
  delay(50);
}
```

SOURCE
FOR CODE

Schematic of stepper and motor driver:
https://www.circuitmagic.com/arduino/how-to-run-stepper-motor-with-arduino-using-l298n-driver-module/

Motor inpiration movement

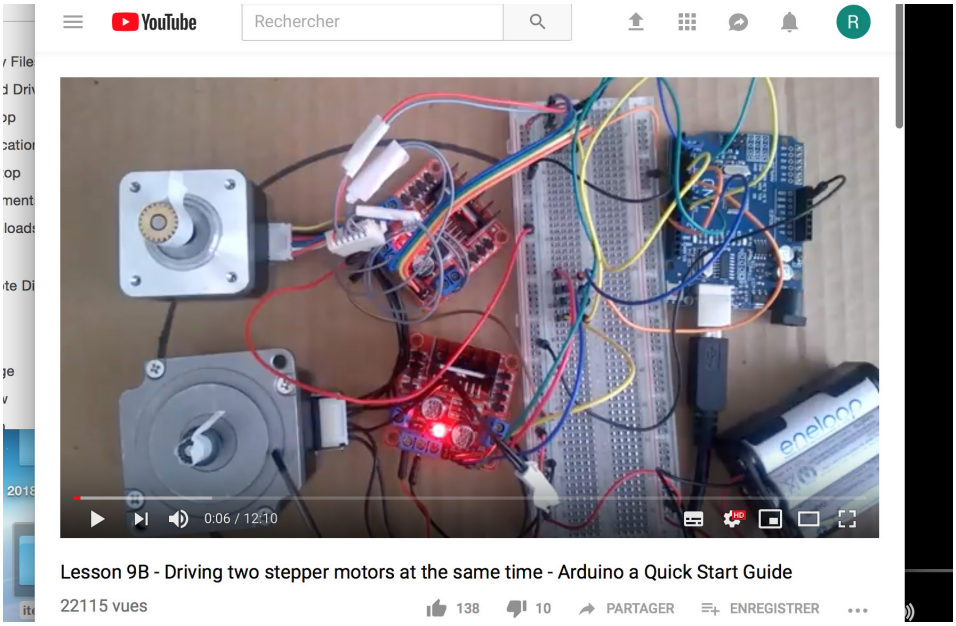
L298N driver module



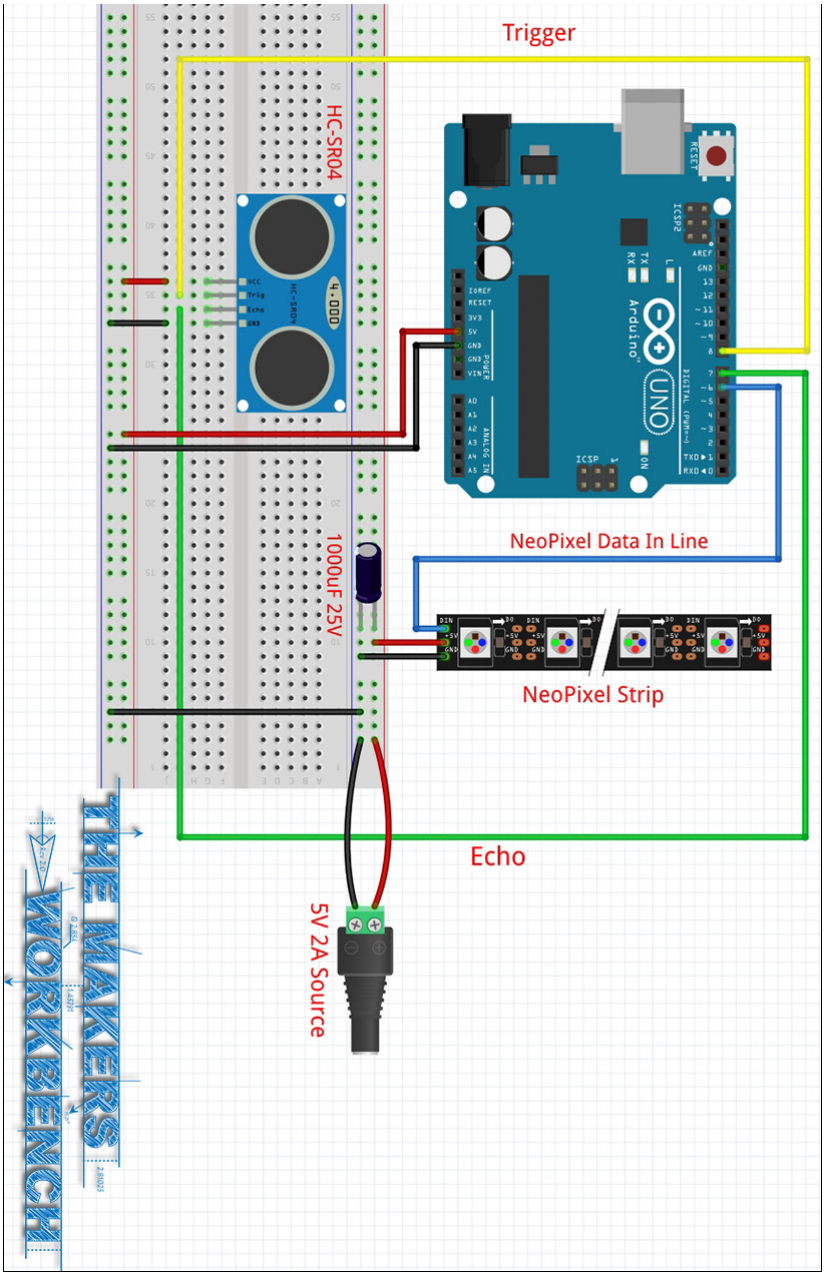
VIDEO for motor:
https://www.youtube.com/watch?v=nw8XaPs8qSs

Video of the code for the motor

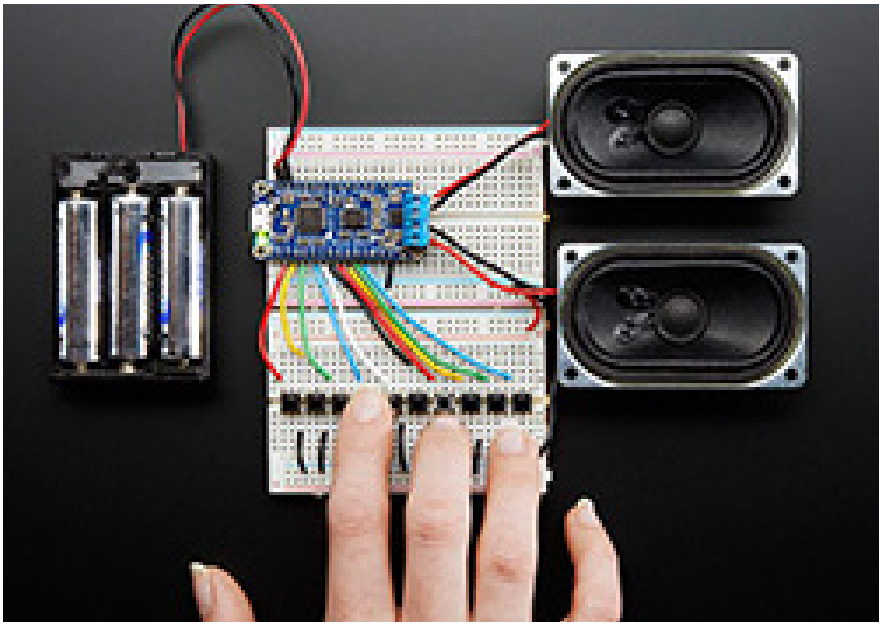
CODE for motor:
https://raw.githubusercontent.com/Seven7au/Arduino_fundamental_Lessons/master/two_steppers_together



CODE for the sensor:
http://www.themakersworkbench.com/tutorial/using-ultrasonic-distance-sensor-illuminate-neopixels



Sound board:
https://learn.adafruit.com/adafruit-audio-fx-sound-board/pinouts



Reference

All code was taken by a website and combined with Elio's help
All pictures in the building process are taken by Rachel Ann Timtiman
All videos are taken by Rachel Ann Timtiman