

# **GOOMB**

by

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# **“THIS” PART ONE**

## **SENSOR RESEARCH & DOCUMENTATION**

**SENSOR ONE:** SEN-13285 PIR MOTION SENSOR  
(JST)

Model: SEN-13285

**VSENSOR TWO:** HC-SR04 ULTRASONIC RANGING  
MODULE - 4 PIN

MODEL: CK-1033

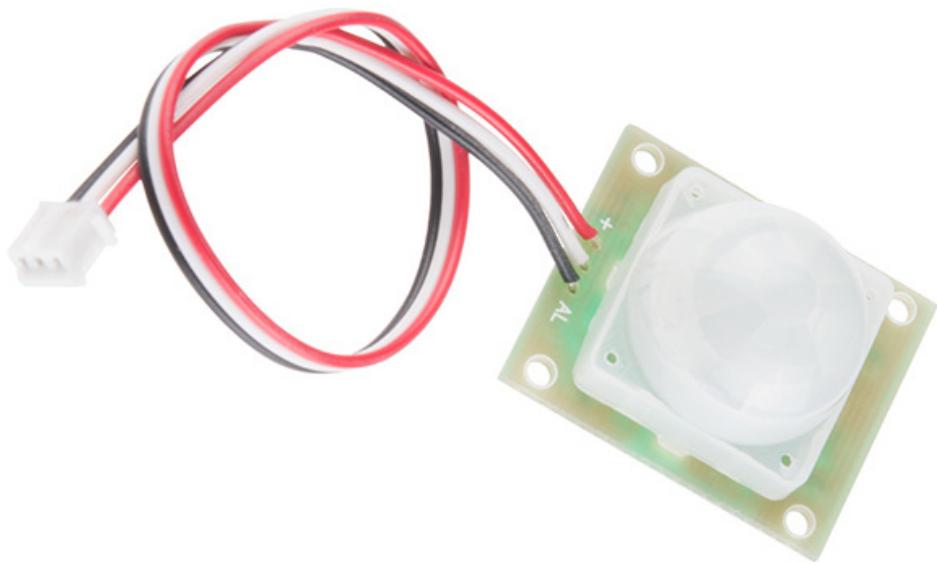
SENSOR ONE: SEN-13285 PIR Motion Sensor (JST)

Model: SEN-13285

We considered the PIR Motion Sensor as a candidate. However, it did not meet the project requirements because it is a digital sensor nor did it meet our Get Out Of My Bubble project needs for three distance thresholds.

For further details refer to SE-10.pdf

CODE and Library for Sharp IR Sensor :  
<https://github.com/guillaume-rico/SharpIR>



**SENSOR TWO:** HC-SR04 ULTRASONIC RANGING  
MODULE - 4 PIN

Model: CK-1033

SENSOR TWO: HC-SR04 ULTRASONIC RANGING  
MODULE - 4 PIN

MODEL: CK-1033

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

High-accuracy : 0.3cm

Input trigger signal : 10us TTL impulse

Echo signal : output TTL PWL signal

Size : 45\*20\*15mm

voltage requirements: 5V(DC)

We did several tests to determine if the sensor would work for our project. It proved effective however, the project requirements were to use an analog sensor and as a result we did not use this digital distance sensor.

For further details please refer to the HC-SR04Us-

ers\_Manual.pdf

[HTTPS://WWW.SPIKENZIELABS.COM/CATALOG/INDEX.PHP?MAIN\\_PAGE=PRODUCT\\_INFO&CPATH=122\\_116&PRODUCTS\\_ID=939&ZENID=decae7feba1898bbaccf6ea62fd1740](https://www.spikenzielabs.com/catalog/index.php?main_page=product_info&cPath=122_116&products_id=939&zenid=decae7feba1898bbaccf6ea62fd1740)



## **SENSOR THREE: GP2Y0A02YK0F - INFRARED PROXIMITY SENSOR LONG RANGE**

Model: SEN-08958

### Features

1. Distance measuring range : 20 to 150 cm
2. Analog output type
3. Package size : 29.5×13×21.6 mm
4. Consumption current : Typ. 33 mA
5. Supply voltage : 4.5 to 5.5 V

### Applications

1. Touch-less switch  
(Sanitary equipment, Control of illumination, etc. )
2. Sensor for energy saving  
(ATM, Copier, Vending machine, Laptop computer, LCD monitor)
3. Amusement equipment  
(Robot, Arcade game machine)

### Description

1. Distance measuring range : 20 to 150 cm
2. Analog output type
3. Package size : 29.5×13×21.6 mm
4. Consumption current : Typ. 33 mA
5. Supply voltage : 4.5 to 5.5 V

We chose this analog distance sensor because it met the criteria required for the project and met our project needs as well. It is easy to install and produces

reliable results.

For further details refer to gp2y0a02yk\_e.pdf

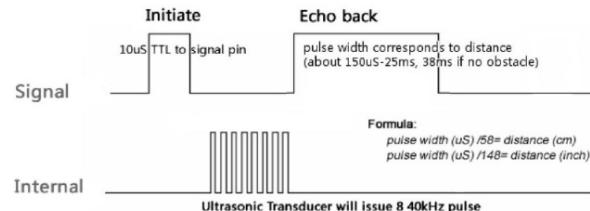
<https://abra-electronics.com/sensors/sensors-proximity-en/gp2y0a02yk0f-infrared-proximity-sensor-long-range-gp2y0a02yk0f.html>

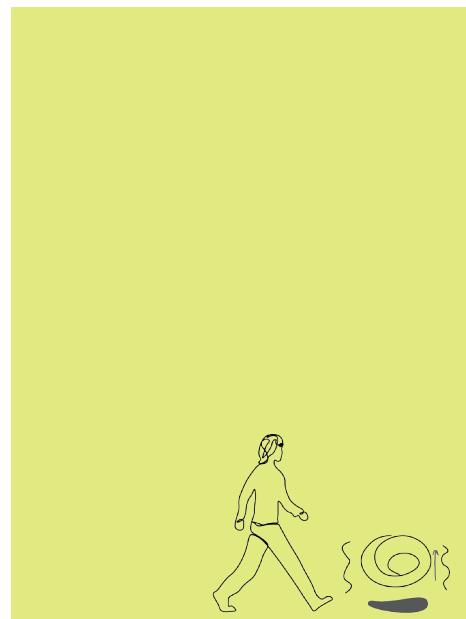
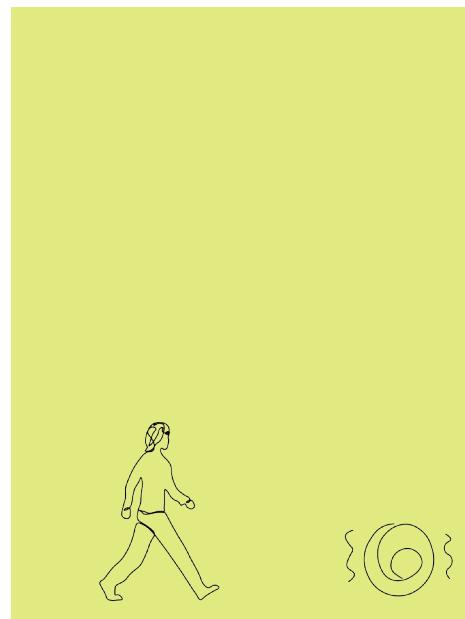
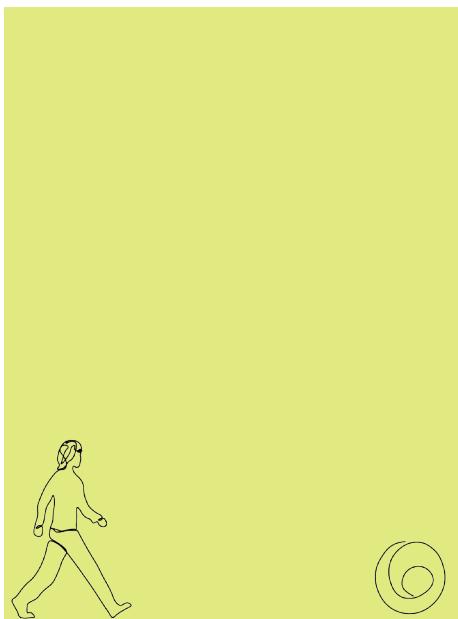
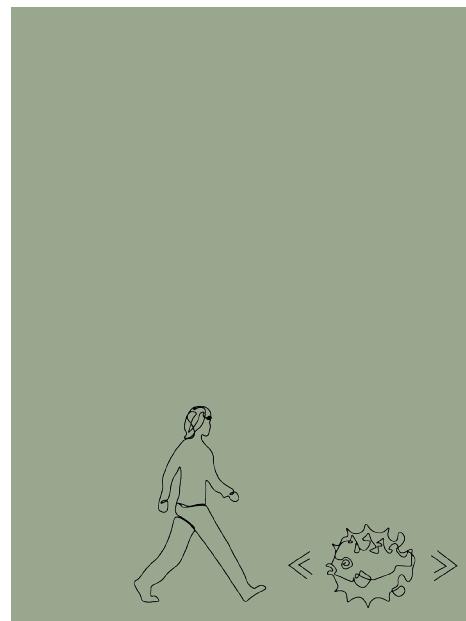
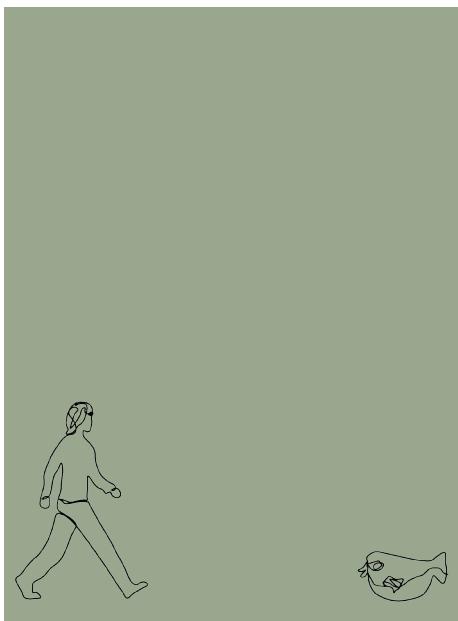
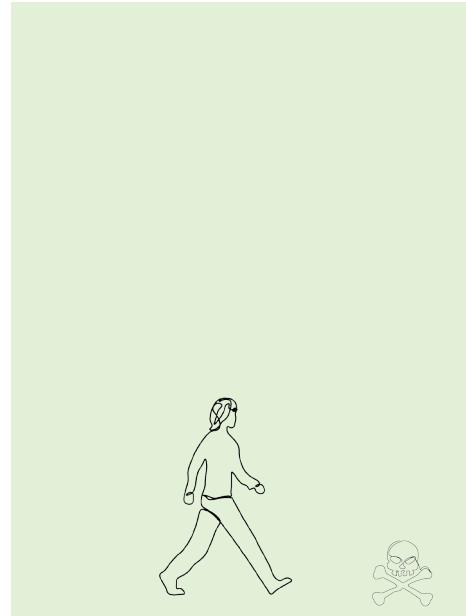
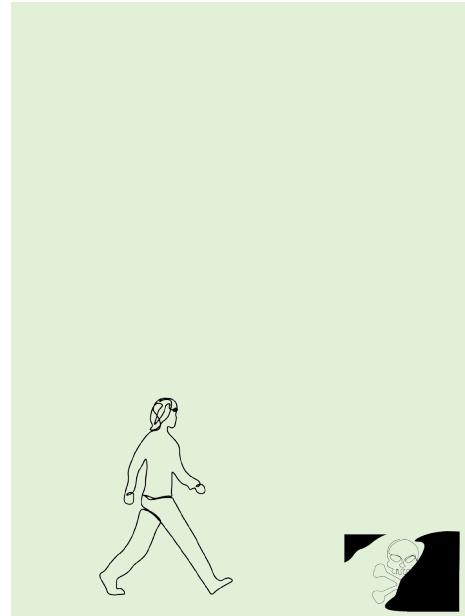
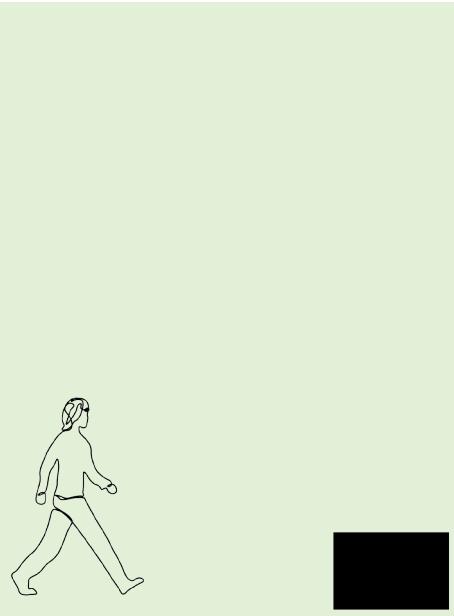
Source: HC-SR04Users\_MAnual.pd

The timing diagram of HC-SR04 is shown. To start measurement, Trig of SR04 must receive a pulse of high (5V) for at least 10us, this will initiate the sensor will transmit out 8 cycle of ultrasonic burst at 40kHz and wait for the reflected ultrasonic burst. When the sensor detected ultrasonic from receiver, it will set the Echo pin to high (5V) and delay for a period (width) which proportion to distance. To obtain the distance, measure the width (Ton) of Echo pin.

Time = Width of Echo pulse, in uS (micro second)

- Distance in centimeters = Time / 58
- Distance in inches = Time / 148
- Or you can utilize the speed of sound, which is 340m/s





# **“THIS” PART TWO**

**DESIGN & BUILD A MID FIDELITY THING**

# Design description & Concept

We spent a couple of hours brainstorming the concept for the Get Out Of My Bubble (GOOMB) project. The premise is based on the frustration of dealing with people who show a lack of respect and courtesy in every day life. This project aims to sensitize without aggression to make people aware of their behaviour when they interact with the GOOMB. The details of the inspiration follow. This project allowed us to experiment with the following technologies: Thermocromic Inc, vibrating motors, analog and digital motion and distance sensors, neopixels and RGB LEDs, conductive material such as thread, paper and heating pads, conductive tape using power by battery, computer, arduino and voltage pack. Our assembly allowed us to use screen printing, vinyl cutting, sewing by hand machine and soldering and all held together with fusible interfacing. In summary we decided that the project would work in a four phase sequence.

## BUILD IN FOUR PHASES:

### Phase 1

The basic breadboard design to determine the proof of concept.

### Phase 2

Minimum target for mid for October 19  
Working Prototype as a separate entity

### Phase 3

Target for mid for October 19  
Working Prototype as a wearable. Let's start with a cowl because it is easy to design, produce and wearable for anybody.

### Phase 4

The final product in the form of a jacket with all the bells and whistles.

## CHANGE CAN BE:

Vibration  
Lights  
Visual

## BRAIN STORMING SENSOR

NAME: GOOMB

Just Back Off  
Bubble Friendly

AGE:  
childish - cry baby, angry baby, latin, bubble

What is the story behind your design?

When you are on the bus and people are in your bubble. Lack of respect. Don't want to breathe into other peoples area. Why don't you sit somewhere else because there is so much space. Quit shoving the chair. Be mindful of your surroundings. You are not the only one. Somebody slapped me with wet hair. Am I invisible. Rude.

I keep everything inside and you explode at a certain time and take it out on the next person you meet.

Where does it come from?

born as an expression of frustration due to a lack of politeness and courtesy in everyday life.

Why does it exist?

make people aware of other people's behaviour

What is the personality of your design?

angry  
happy  
overwhelmed

How does its personality manifest itself in the physical world?

blinking eyes  
approach it quickly turns red gets bigger  
if you stop moving then it starts getting smaller and  
turns beach blue  
add breathing, snoring simulate with leds

happy sounds when you add flashlight it is comforted  
(turns purple) and purrs  
when you touch it ---> it turns black with thermo-  
chromic ink by heating wires embedded in the fabric  
of the and shrinks. Shows a message BACK OFF.  
twitching  
jumping  
changing colours

What makes your design do what it does?  
sensor - distance  
when you get close it jumps up  
hair dryer  
thermochromic ink  
fabric  
normal ink  
Pelletier junction - -> to chg heat/cold uses lots of  
power  
  
mini air compressor

What emotions does your design evoke/provoke, are  
they the same for everyone ?

evoke  
compassion  
change in behaviour to a better behaviour  
  
provoke  
keep your distance

# Moodboard

Wearable Fashion Trends



Image.1



Image.2



Image.3

## Bio Circuit - a wearable soundscape

This video depicts the collaborative wearable technology project of Bio Circuit in action. Bio Circuit was created at Emily Carr University by Industrial Design...

[vimeo.com](#)



Image 4:



Alonso Martinez's 3D-Printed Animated Robots!

Image 6:

Image 5:

Heating Pad - 5x15cm



Function: Did not work. It was too weak to heat the thermocromic. Therefore, it was way too long to turn it white.

We decided to use conductive thread



Infrared Proximity Sensor Long Range - Sharp GP2Y0A02YK0F

It can sense until 5feet away.



Two 9 volt batteries for power

Five vibrating motors to show that we are mad at the person intruding into our bubble. The garment vibrates at the same time to make us relax. In fact, getting a massage behind the neck makes us relax and less pissed off the world.

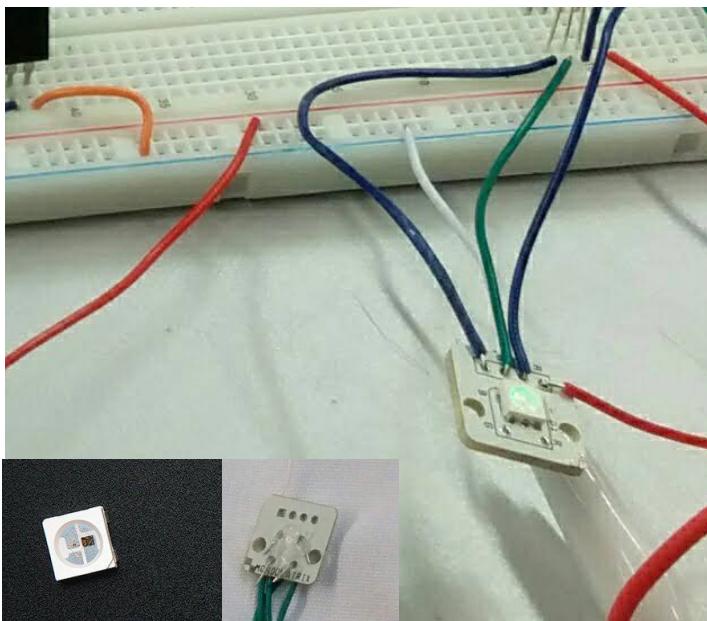


Transparent base to screen mix with the thermochromic pigment.



Thermochromic pigment mix with transparent base to screen print our skull.

The pigment reacts to the heat and the cold.  
When heated it turns white.  
When it's cooled it turns back to its pigment color



We used 2 neopixels for our buttons to light up.

This shows 3 color of mid and high levels of frustration against the person coming close to our bubble.

0 light: phase 0 (relaxed)  
Blue: phase one (disturb)  
Green: phase two (mid angry)  
Red: phase three (very angry)



Transparent base to screen mix with the thermochromic pigment.



White cotton is less heavy than the cotton canvas.  
The white fabric reacts faster than the cotton canvas for the heat.



First test thermocromic and a bit of black ink, did not make the skull drawing appear. It showed a slight change to white



Second test: Thermocromic ink turns white when heated and the skull appears.

Failed test:

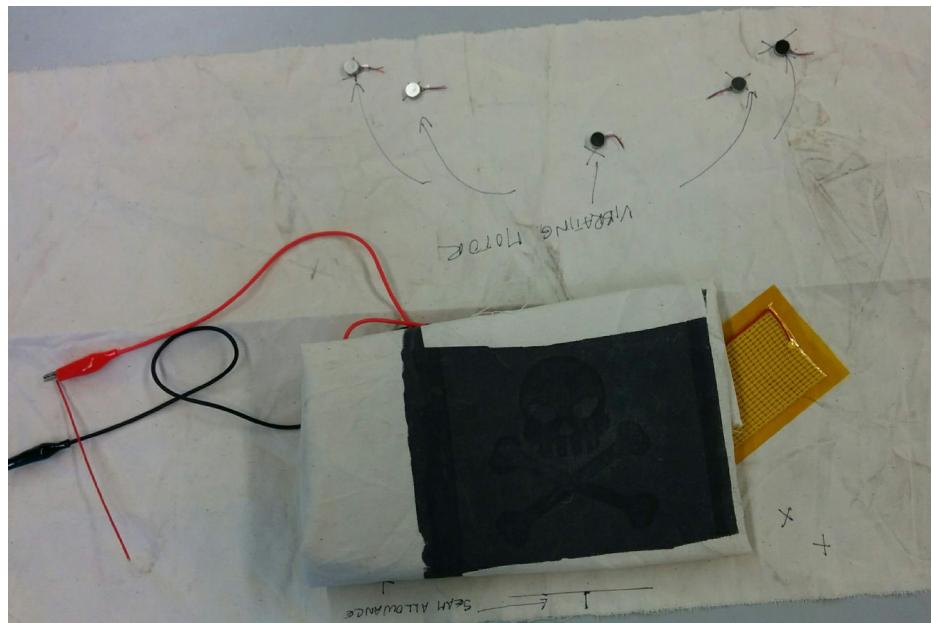
The 1st try we used thermocromic ink with a little bit of black dye and it did not turn white to make the skull disappear.



# Heating pad test

1st test for the heating pad:

The heating pad did not work because there is too much resistance on the yellow pad. It required a lot of voltage to generate the current required and the heating process was not fast enough. Therefore, the heating pad did not meet our requirements.



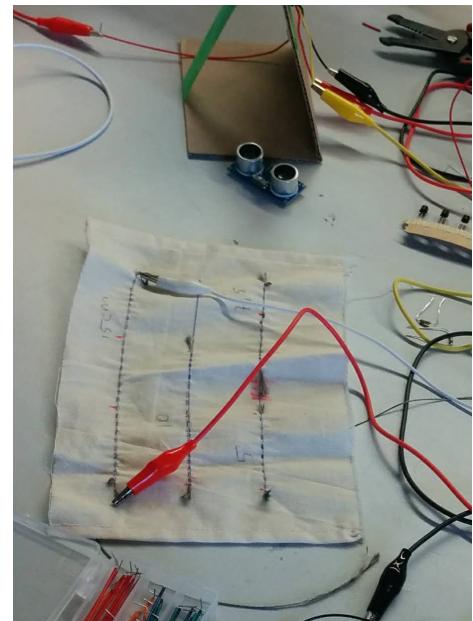
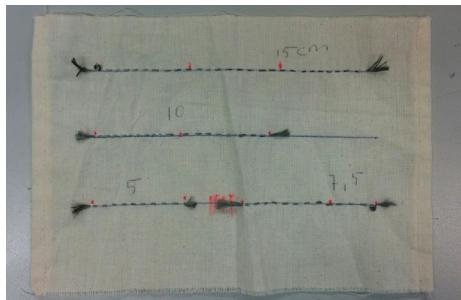
Second heating pad test with the conductive thread.

How much it heats up?

How fast it heats up?

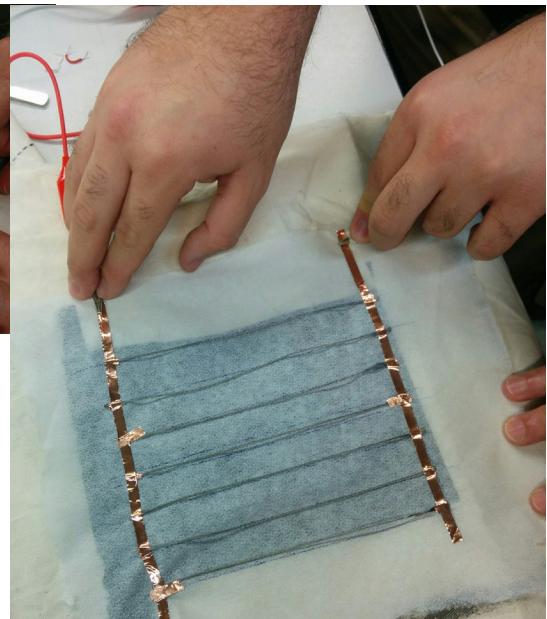
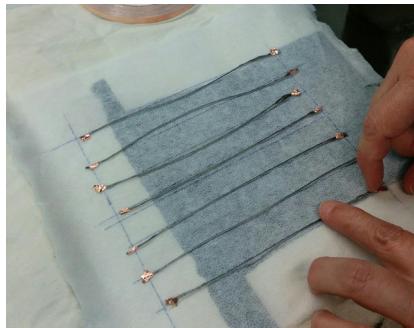
How much time does it cool down?

How much voltage does it take?



We put 7 threads of 15cm in series.

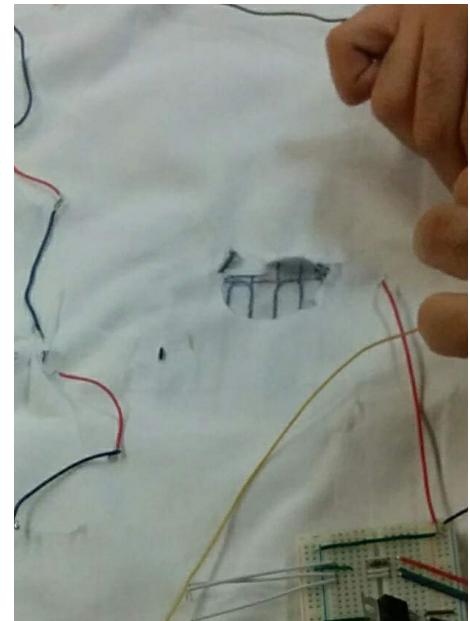
We connected it with copper wire. It did not work because we needed to connect the copper side not the adhesive one to the thread. We tried connecting them with thinner conductive thread. It did not work.



# Scale of Skull

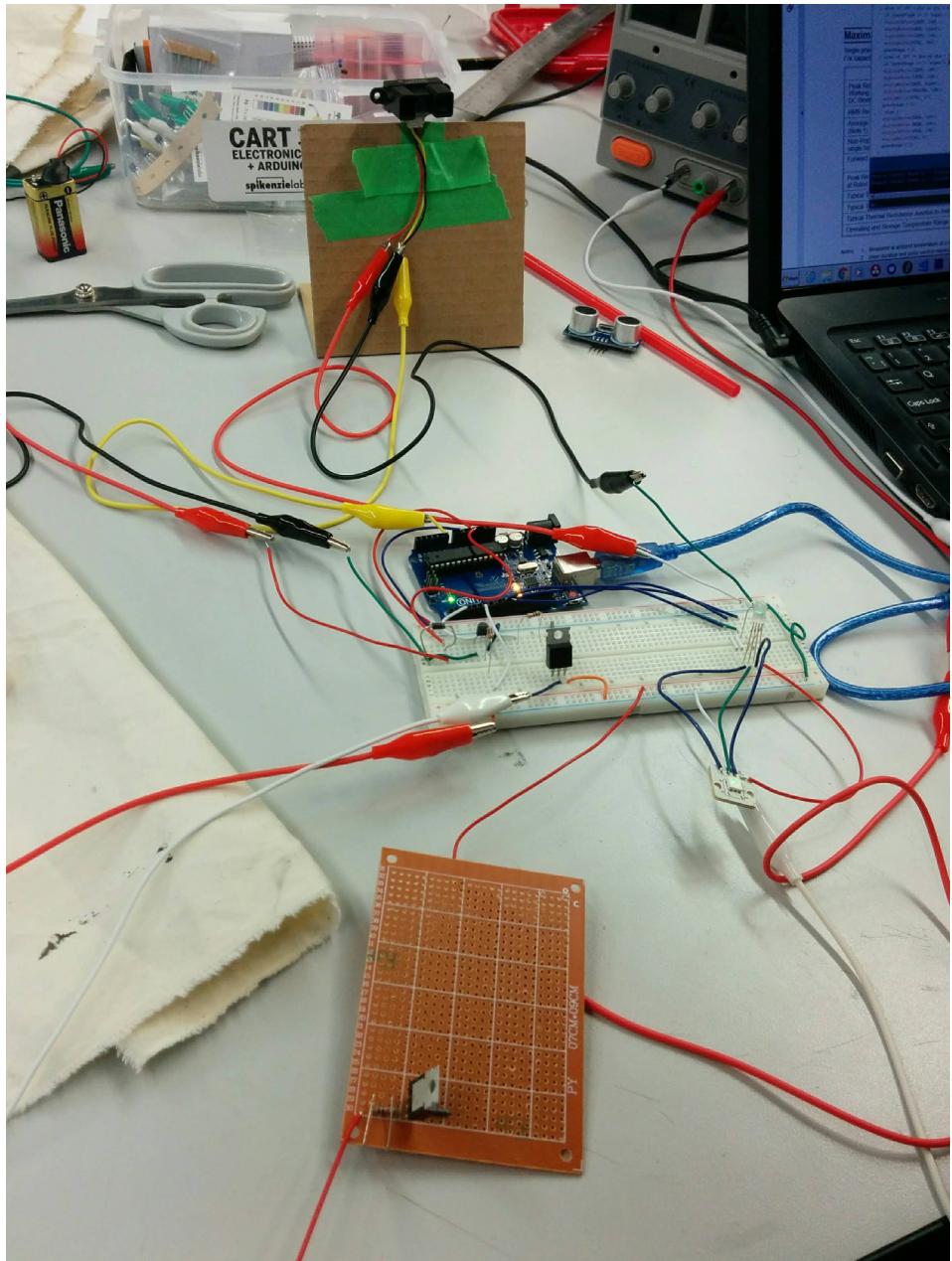
We decided to shrink the skull to 2.5 inch

We also used a 16inch conductive thread to make the skull appear as seen in the circle fabric

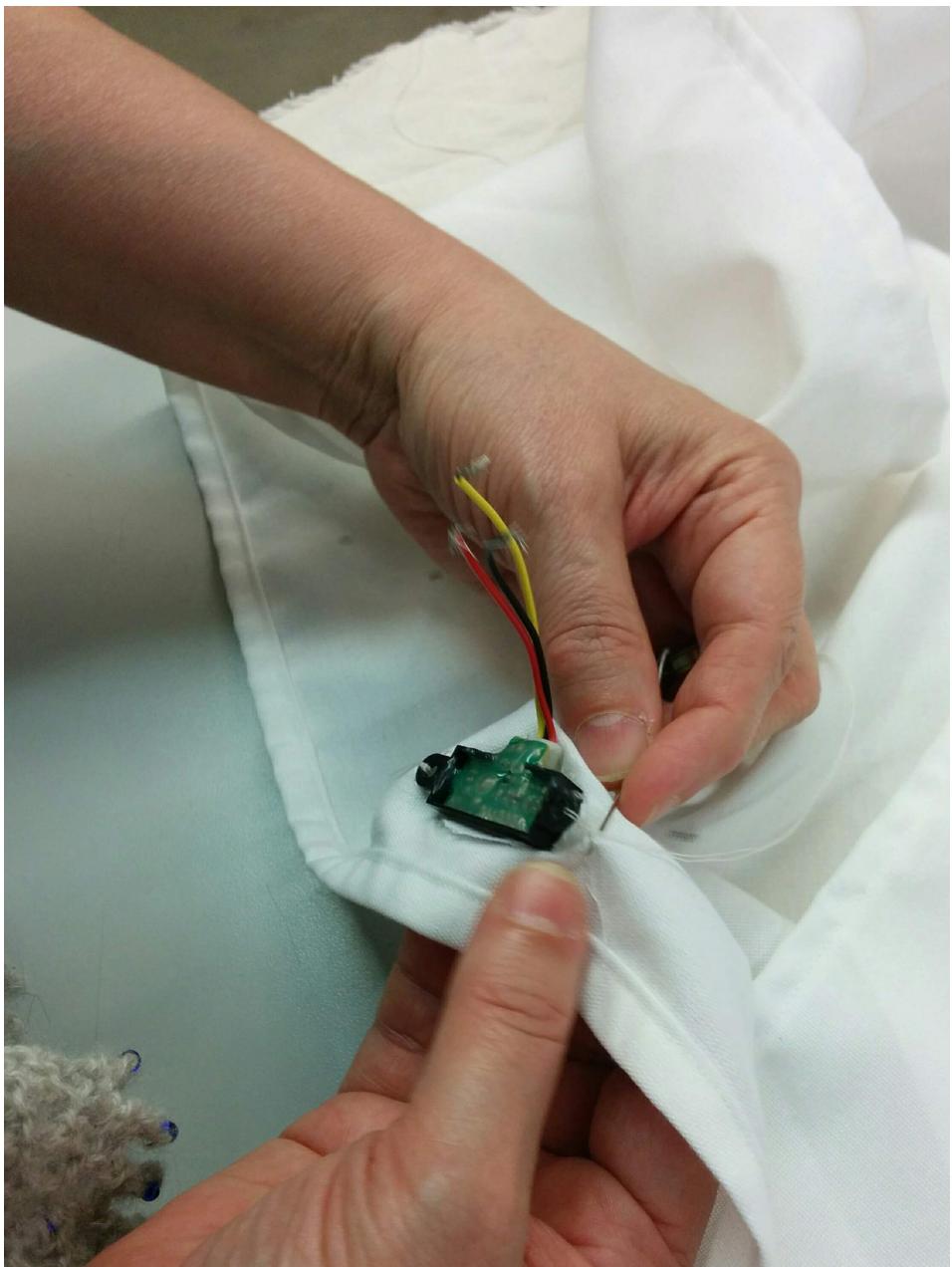


## Building process

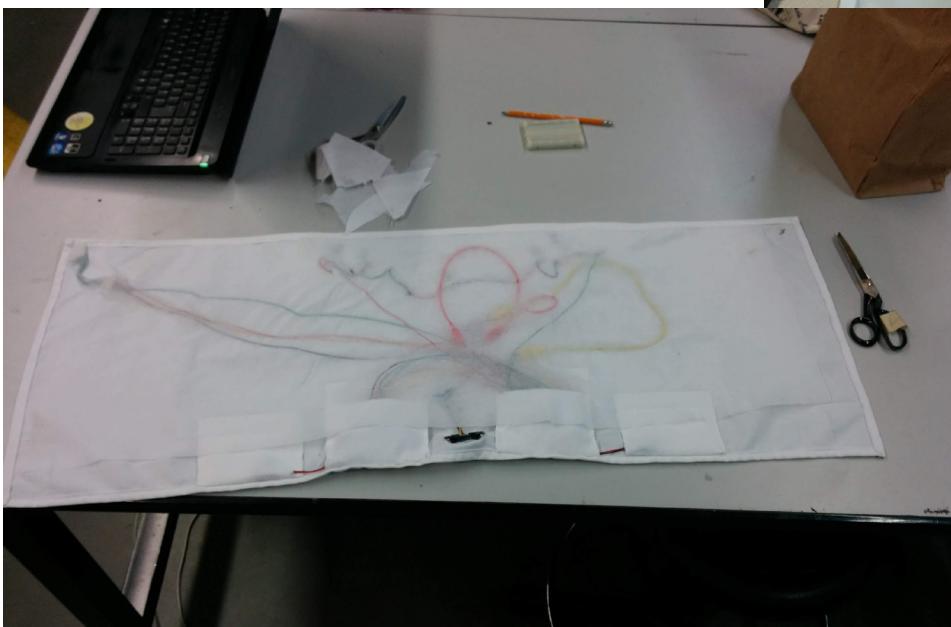
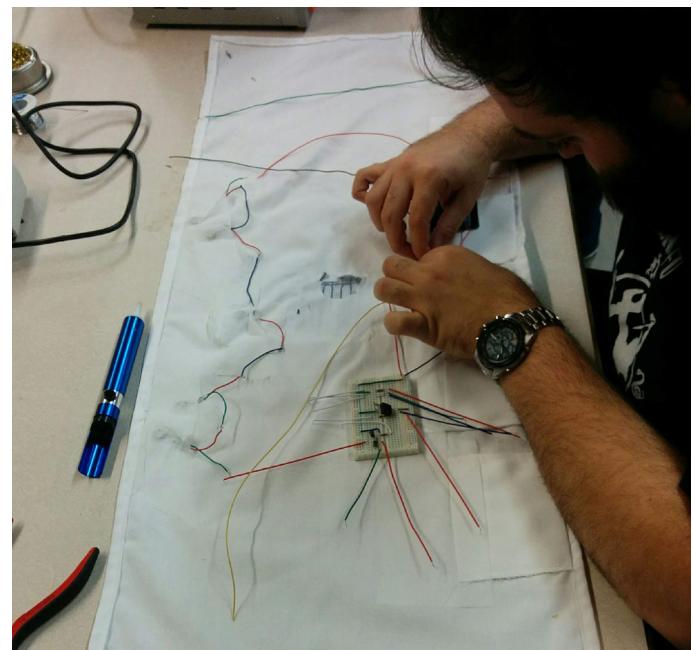
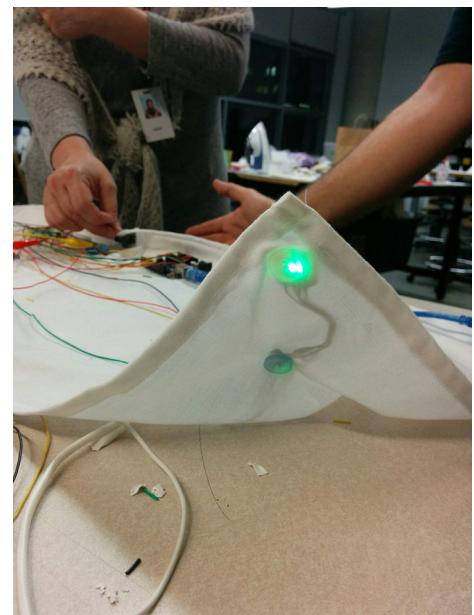
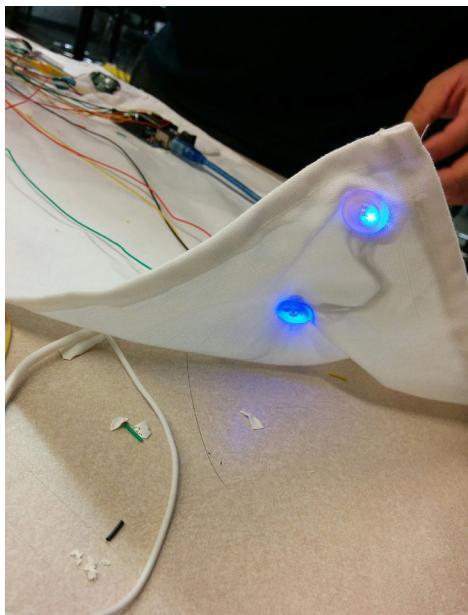
Testting the code with the light, sensor,



Sewing by hand and machine



**Testing the sensor  
if everything is well  
connected before  
soldering  
everything and clos-  
ing the fabric on the  
back side**



# Analog Sensor Code

1st try

The screenshot shows the Arduino IDE interface. The title bar says "1st\_try | Arduino". The code editor window contains the following C++ code for an analog sensor project:

```
1st_try
/** 4A Trigger a fadeIn / fadeOut with LED + Button USING FOR LOOP ***/

#define LEDR 3
#define LEDG 5
#define LEDB 6
#define sensor A0 // Sharp IR GP2Y0A41SK0F (4-30cm, analog)

void setup()
{
    Serial.begin(9600);
    //pinMode(LED_PIN, OUTPUT);
    pinMode(LEDR, OUTPUT);
    pinMode(LEDG, OUTPUT);
    pinMode(LEDB, OUTPUT);
}

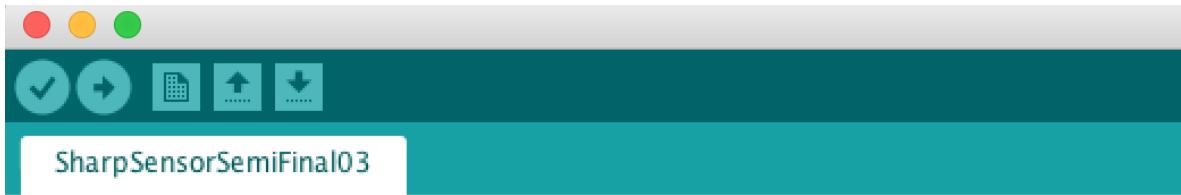
void loop(){
    int distance = analogRead(sensor); // read value from button
    Serial.println(analogRead(sensor));
    delay(250);
    if (distance >= 400) {
        digitalWrite(LEDR, HIGH);
        digitalWrite(LEDG, LOW);
        digitalWrite(LEDB, LOW);
        delay(250);
    } else if ( 200 < distance < 400) {
        digitalWrite(LEDG, HIGH);
        digitalWrite(LEDR, LOW);
        digitalWrite(LEDB, LOW);
        delay(250);
    } else if (distance <= 200) {
        digitalWrite(LEDB, HIGH);
        digitalWrite(LEDG, LOW);
        digitalWrite(LEDR, LOW);
    } else {
        digitalWrite(LEDR, LOW);
        digitalWrite(LEDG, LOW);
        digitalWrite(LEDB, LOW);
        delay(250);
    }
}

Done compiling.

Sketch uses 2316 bytes (7%) of program storage space. Maximum is 32256 bytes.
Global variables use 188 bytes (9%) of dynamic memory, leaving 1860 bytes for local variables.
```

The status bar at the bottom indicates the sketch uses 2316 bytes (7%) of program storage space, with a maximum of 32256 bytes available. Global variables use 188 bytes (9%) of dynamic memory, leaving 1860 bytes for local variables.

## Semi Final code



```
#include <SharpIR.h>

#define LEDR 11
#define LEDG 10
#define LEDB 9

#define HEATER 3

#define VIB1 6

#define ir A0
#define model 20150
// ir: the pin where your sensor is attached
// model: an int that determines your sensor: 1080 for GP2Y0A21Y
//                                     20150 for GP2Y0A02Y
//                                     (working distance range accc

SharpIR SharpIR(ir, model);

int wiper = 0;
int prevStage;
int currentStage;

boolean wipeUp = 1;

//int ledPin = 13;           // choose the pin for the LED

void setup() {
  // put your setup code here, to run once:
  Serial.begin(9600);

  pinMode(LEDR, OUTPUT);
  pinMode(LEDG, OUTPUT);
  pinMode(LEDB, OUTPUT);
  pinMode(HEATER, OUTPUT);
  pinMode(VIB1, OUTPUT);

}

void loop() {
  delay(15);
```

```
// unsigned long pepe1 = millis(); // takes the time before the loop or
int dis = SharpIR.distance(); // this returns the distance to the object

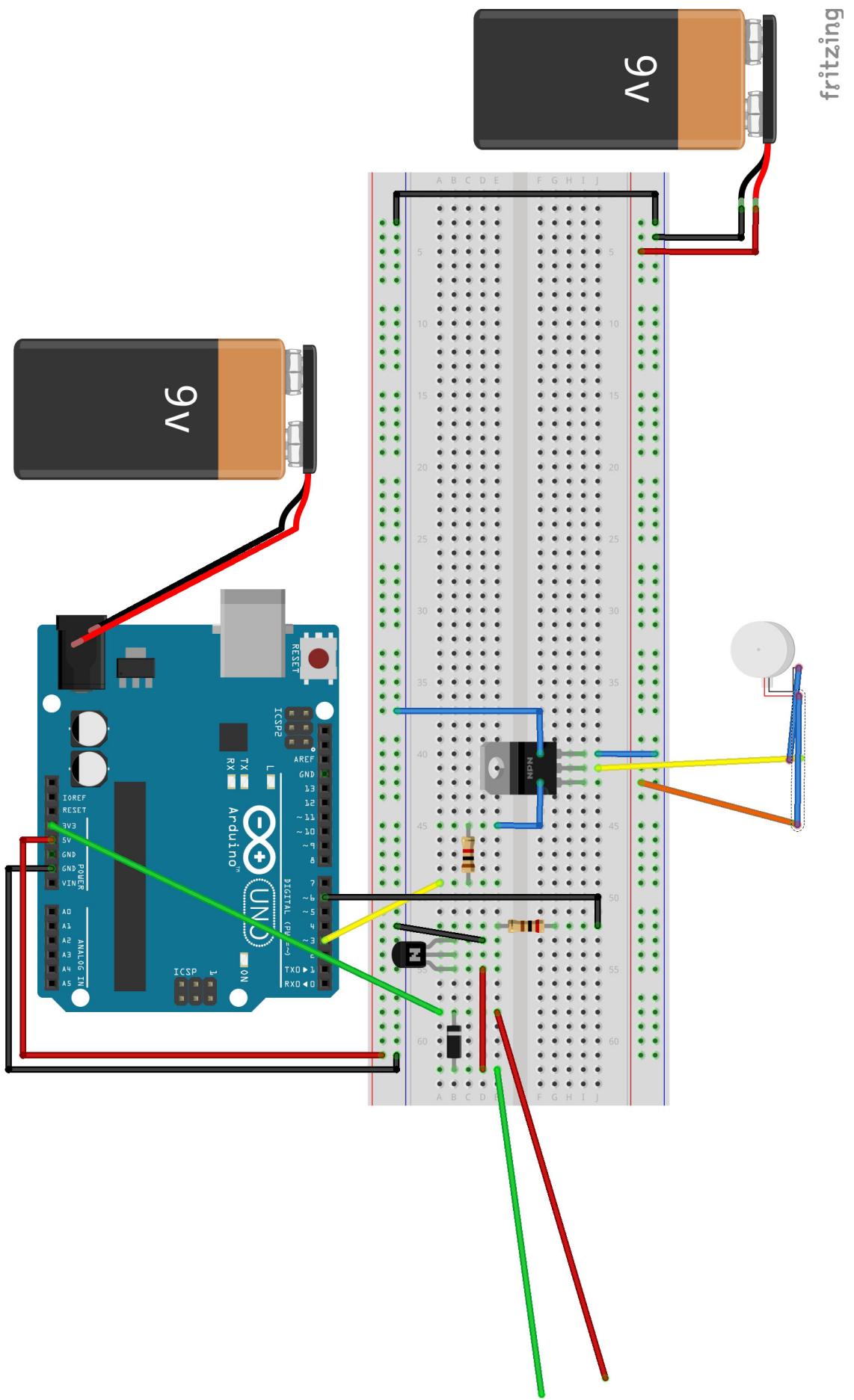
Serial.print("Mean distance: "); // returns it to the serial monitor
Serial.println(dis);

// unsigned long pepe2 = millis() - pepe1; // the following gives you t
// Serial.print("Time taken (ms): ");
// Serial.println(pepe2);

if (dis <= 30) {
    if (prevStage != 3) wiper = 0;
    analogWrite(LED_R, wiper + wiper/2);
    digitalWrite(HEATER, HIGH);
    digitalWrite(LED_G, LOW);
    digitalWrite(LED_B, LOW);
    analogWrite(VIB1, 255);

    prevStage = 3;
} else if (31 < dis && dis < 57) {
    if (prevStage != 2) wiper = 0;
    digitalWrite(LED_R, LOW);
    analogWrite(LED_B, wiper);
    digitalWrite(LED_G, LOW);
    analogWrite(VIB1, 150);
    prevStage = 2;
} else if (57 <= dis && dis < 70) {
    if (prevStage != 1)wiper = 0;
    digitalWrite(LED_R, LOW);
    digitalWrite(LED_B, LOW);
    analogWrite(LED_G, wiper);
    digitalWrite(HEATER, LOW);
    analogWrite(VIB1, 0);
    prevStage = 1;
} else {
    digitalWrite(LED_R, LOW);
    digitalWrite(LED_B, LOW);
    digitalWrite(LED_G, LOW);
    analogWrite(VIB1, 0);
    prevStage = 0;
}

wiper += 3;
// else if (!wipeUp) wiper -= 3;
}
```



fritzing

## Reference

Image 1:

<https://readwrite.com/2014/03/11/wearable-computing-soft-electronics-clothing/#awesm=~oy-qrPXb2Sj4Ws1>

Image 2: <https://www.pinterest.ca/pin/16677461093974689/>

Image 3: <https://www.pinterest.ca/pin/284289795206603629/>

Image 4: <https://www.pinterest.ca/pin/159455643031224046/>

Image 5: <http://www.thebirdwheel.com/open-call-lilypad-apparel-project>

Image 6: <https://www.youtube.com/watch?v=0vfUOW1tsX0>