

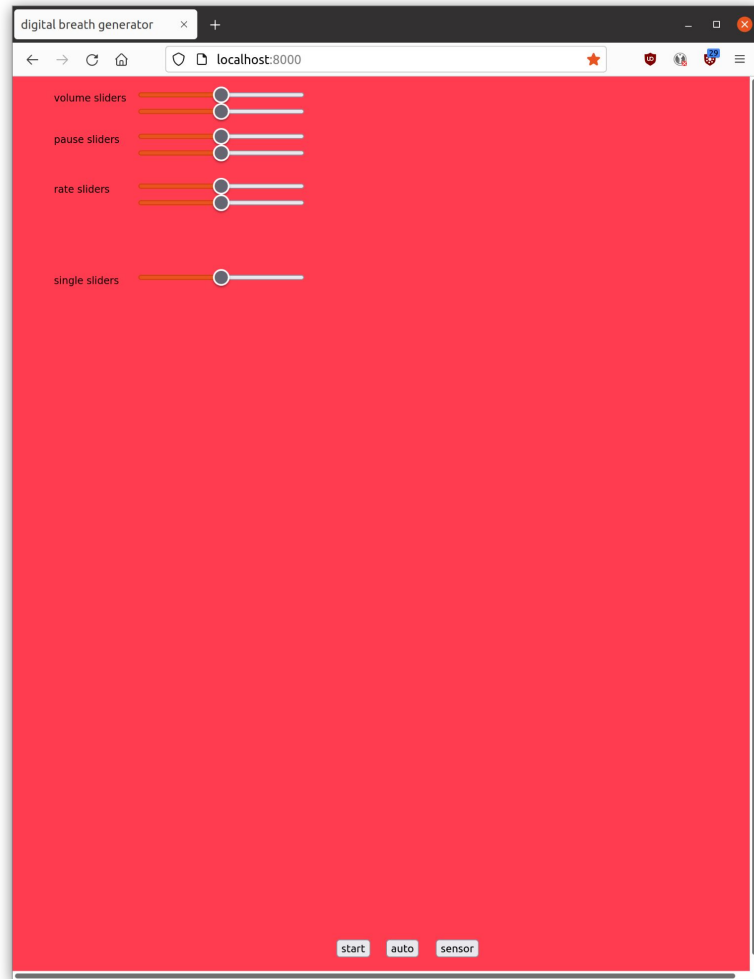
Major Studio One: Prototype Three

Based on user feedback from prototype two, I tried to incorporate the following elements into my third prototype:

- obvious visual reference to lungs
- dynamic breathing sounds that vary with user interaction
- improve visibility of the diaphragm for demonstration

First, I worked on creating a digital breath generator that could respond to user proximity. I started this by reading a couple medical papers about the frequency analysis of breathing noises. these were booooooring and definitely not useful given my range of audio engineering skills.

After scrapping that idea I simply separated the inhale and exhale components of a generic breath noise I found on YouTube. I then created a p5.js sketch which allowed me to change the spacing of the two noises as well as their pitch and volume.



You can try the generator here:

<https://lauriaclarke.github.io/finalproject/digitalbreath/code/>

There are three modes:

manual - control all six sliders individually

auto - control breathing noises based on the input of a single slider

sensor - control output based on sensor input value (REQUIRES ARDUINO HOOKED UP)

You may be wondering about the sensor mode. My ultimate goal was to get this generator to respond to the output of a motion sensor. To simulate this I created a method for generating intensities of breath based on a value between 0 and 1 (single slider mode). Once this worked, I hooked up the motion sensor and mapped its output to a range between 0 and 1.

digital breath generator

localhost:8080

volume sliders

pause sliders

rate sliders

single sliders

start

auto

sensor

Inspector

Console

Errors

Warnings

Logs

Info

Debug

CSS

XHR

Requests

Filter Output

GET http://localhost:8080... [HTTP/1.0 404 File not found 0ms]

Use of the orientation sensor is deprecated. p5.js:63242:25

Use of the motion sensor is deprecated. p5.js:63242:25

ws://localhost:8081 p5.serialport.js:75:15

inhalé 0.40138321995464854 sketch.js:66:11

exhalé 0.4451473922962494 sketch.js:67:11

opened socket p5.serialport.js:83:15

<empty string> sketch.js:311:11

1.00 sketch.js:311:11

<empty string> sketch.js:311:11

0.90 sketch.js:311:11

<empty string> sketch.js:311:11

0.80 sketch.js:311:11

<empty string> sketch.js:311:11

0.70 sketch.js:311:11

<empty string> sketch.js:311:11

0.60 sketch.js:311:11

<empty string> sketch.js:311:11

0.50 sketch.js:311:11

Lauria:~\$python3 -m http.server 8080 &

[1] 78540

Lauria:~\$Serving HTTP on 0.0.0.0 port 8080 (http://0.0.0.0:8080/) ...

Lauria:~\$127.0.0.1 - - [08/Dec/2021 19:59:04] "GET / HTTP/1.1" 200 -

127.0.0.1 - - [08/Dec/2021 19:59:04] "GET /libraries/p5.serialport.js HTTP/1.1" 304 -

127.0.0.1 - - [08/Dec/2021 19:59:04] "GET /sketch.js HTTP/1.1" 304 -

python3

Lauria:~\$

Lauria:~\$

Lauria:~\$Sp5serial

start()

p5.serialserver is running

127.0.0.1 - - [08/Dec/2021 19:59:16] "GET / HTTP/1.1" 304 -

127.0.0.1 - - [08/Dec/2021 19:59:16] "GET /libraries/p5.serialport.js HTTP/1.1" 304 -

127.0.0.1 - - [08/Dec/2021 19:59:16] "GET /sketch.js HTTP/1.1" 304 -

1 clients connected

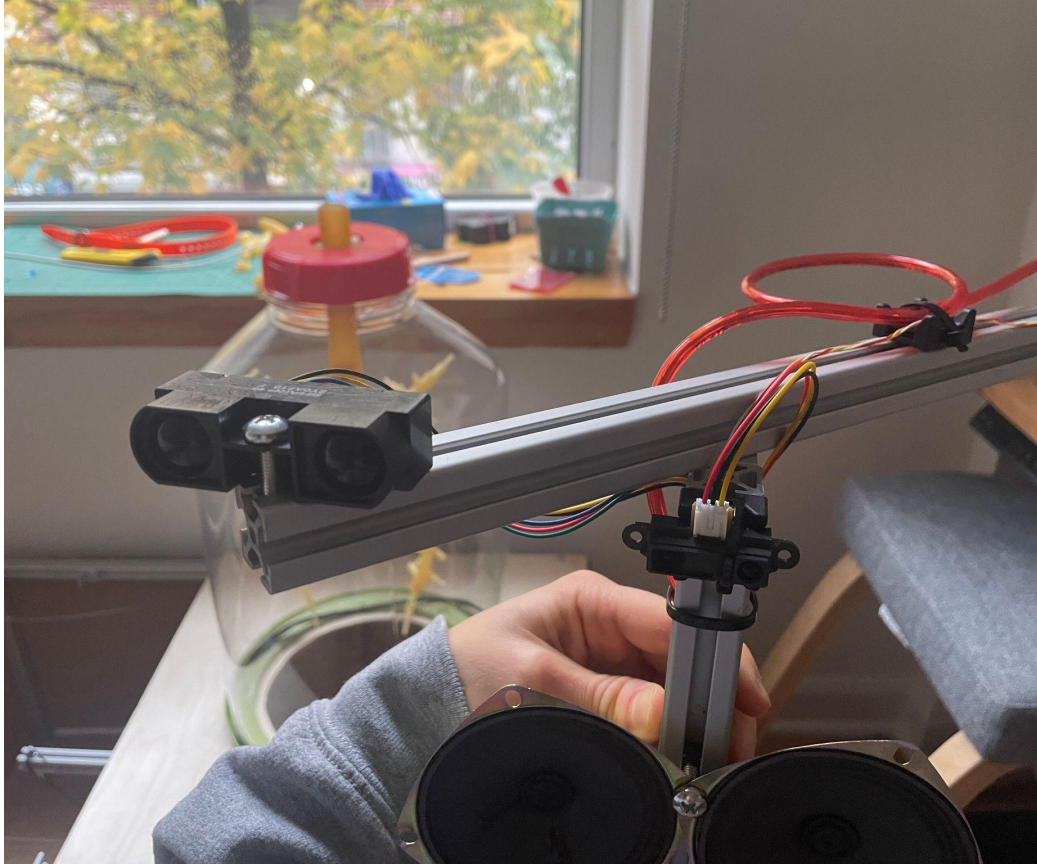
message.method == openseerial

initialize with serial port /dev/ttyACM0

total number of 1 clients subscribed

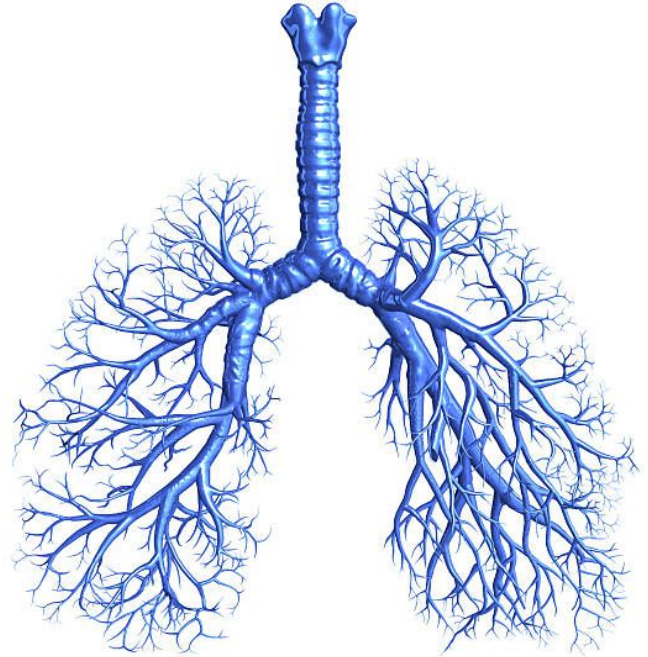
serialPort.open

see the sensor output in the console?
(this isn't actually sensor output, but
incrementing data coming from an
arduino..really similar)

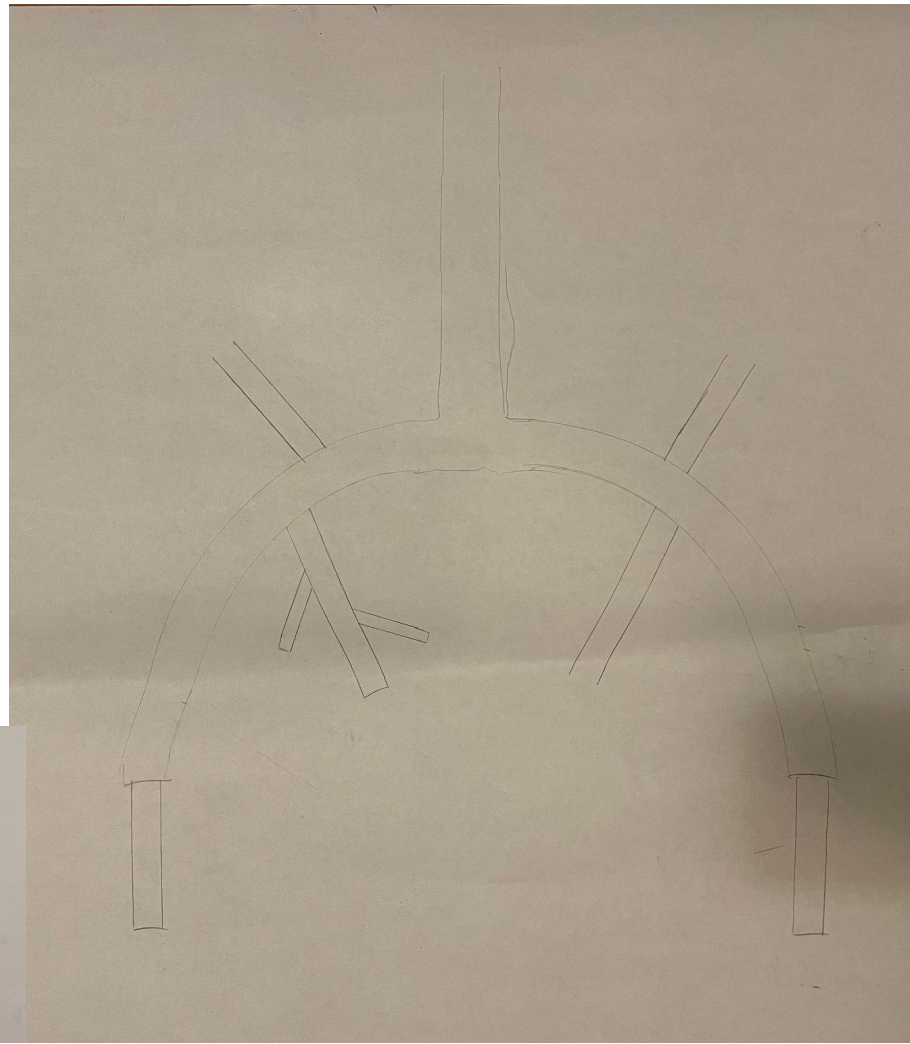
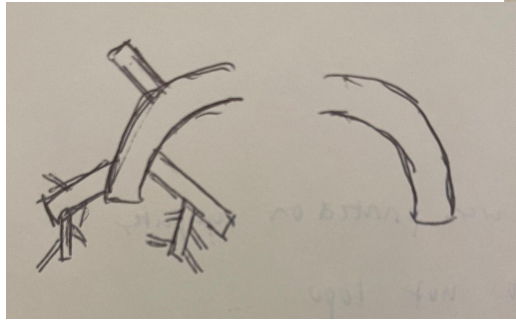


I actually got two distance sensors. One has a range of 1 - 5 meters and one has a range of 10 - 80 cm. I will combine the two outputs to get a smooth range from 5 m to 10 cm.

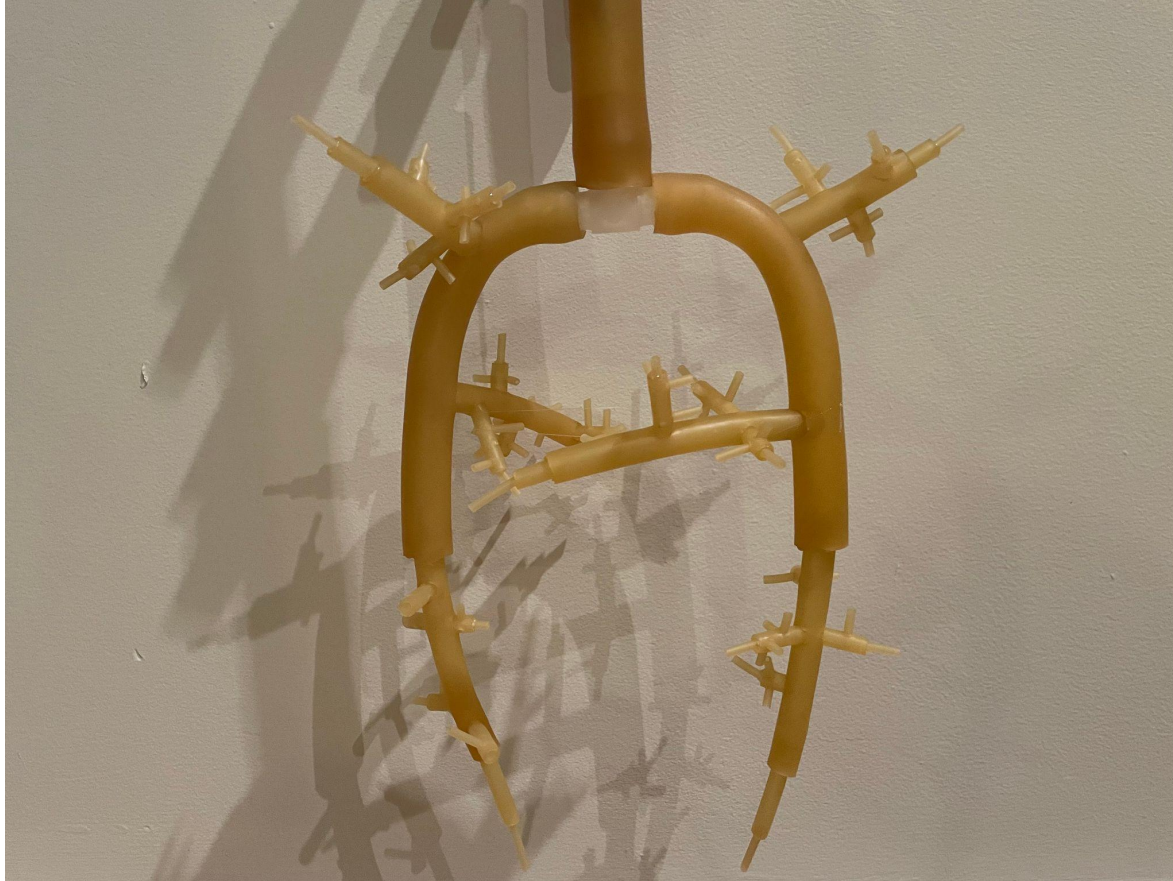
The next step was to create a bronchial tree-like structure. The bronchial tree has an angle of about 70 degrees between the two main branches. I planned to use concentric sizes of latex tubing connected together to achieve something similar.



I knew that I was only going to be able to use 90 degree angles in my replica, so I tried to sketch it out beforehand - both small and "life-sized" - to see how I could still make it look "life-like". These sketches weren't super encouraging ...so I just decided to go for it.



This was the result:



The final result was super duper weird looking and not what I expected. Not bad for a first try though. I learned a lot while working with the latex tubing and think I could create a better variety of angles if I did it again with better (sharper) tools and more tubing. Very cool shadows.

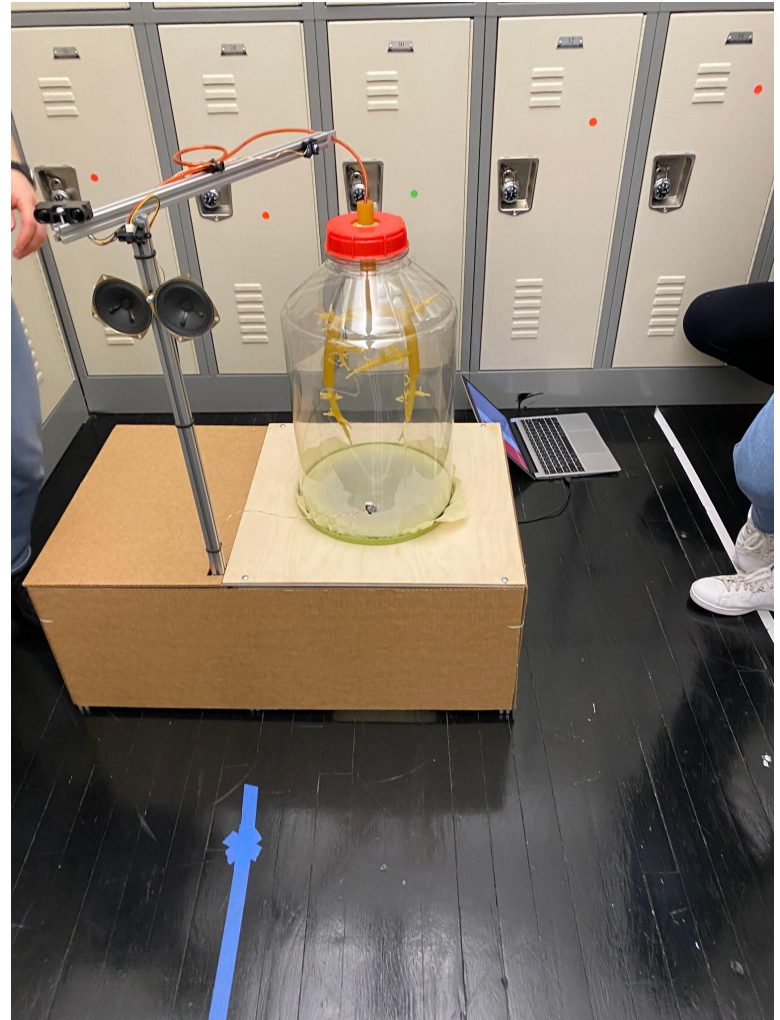
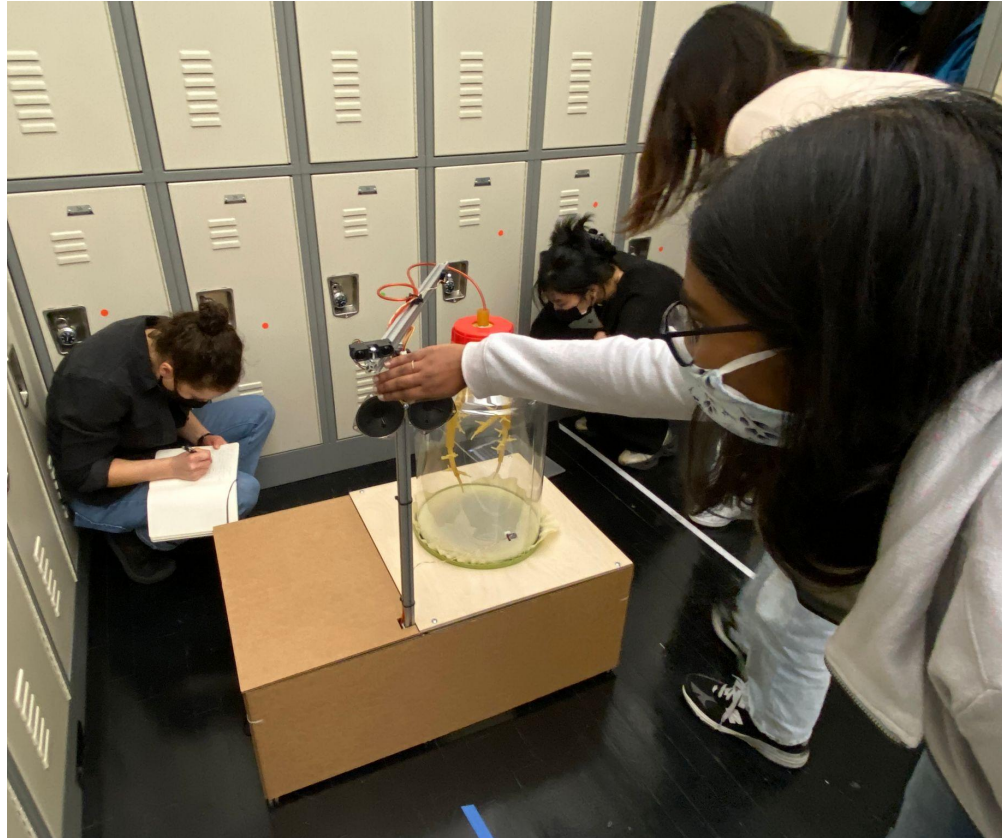
The diaphragm mechanism fell off the list, so I just decided that a manual demonstration would have to suffice.

Then I transported the whole thing to school and set it up in one side of locker hallway with a big tape arrow pointing to the distance sensors. I spent some time playing with each sensor in the space and ultimately decided that until I tuned the algorithm for using both sensors at once, the short sensor would work better for testing.

During the testing I asked users to give me feedback on two specific questions:

1. What does the form remind you of?
2. What is the meaning of the interaction?

There was a lot of interest.



There were so many people I forgot to record any video or photo. Luckily others captured some. I didn't get much written feedback, but was able to record some great verbal interactions. Next is a selection of quotes.

"Is there a person in there?"

"Is that my breathing sound?"

"How does it work?"

"It reminds me of the roots of a plant."

"What do I do?"

"I think the intended interaction [between] the distance of the user and the sounds produced is incredibly powerful."

"This makes me uncomfortable."

"The interaction definitely made me focus on my breathing...the form made me think of lungs."

"...hopefully it will click for users that they can conduct the breathing of the artificial lungs like an experimental instrument..."

"The movement of the latex diaphragm is really creepy!"

"Seeing it actually move and have air come out is the best part."

Based on this feedback I realized I needed to adjust a few things:

- have the digital breath generator noise actually come from the speakers
- make the distance / breath relationship clearer and more active
- create a visual indicator of movement to accompany the breathing
- make it easier to demonstrate the actual kinetic aspect of the piece (diaphragm demonstration)