

# Major Studio One: Prototype Four

Based on feedback from prototype three I wanted to adjust the following:

- 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)

The first thing I did was stop at canal rubber and got a slightly larger piece of 14 mil latex so it would stop slipping out of place. That was an easy one to check off. They definitely know me there. It's a great place to hangout.

Next, the first item on the list seemed easy enough. I had a few spare audio amplifiers laying around from a past project. I hooked these up, added a 3.5mm headphone jack breakout board (which was also in my studio for some reason? David maybe?) and was in business pretty quick! Having the audio actually come from the speakers made it much better.

This moment of success lasted for about five minutes though, because I accidentally stripped one pair of speaker wires too far back and while I was playing at the kitchen table, they crossed in front of the terminal block and blew up the amplifier! I was so bummed. When I stripped them I KNEW it was too far but I just ignored it. Some electrical engineer I am! It's funny when you break a rule that you've known for a long time, think of it in the moment, ignore your thought, and then it comes back to get you in the end.

Luckily I still had one more audio amplifier. I hooked this one up and found that only one channel actually worked, so I just played both speakers from that output. I got a headphone splitter and wired the sound to come from my little portable speaker as well. Overall, this was a good volume level and mix of tones.

At this point I went back to my distance sensing algorithm and tuned it to use a shorter range from the long sensor. I also combined the input from both sensors to create a smoother gradient of change in noise as the viewer approached. This didn't take long, but it made a huge difference. I also made a few tweaks to the javascript side of things to improve code cleanliness.

All was well and looking good. I started doing wire management and getting everything ready to transport.

## **BUT THEN**

It was way too late to be using anything with real power and and while "managing" my cables I plugged the amplifier supply into the 12V output of my battery. It only had a 5V regulator so it blew up. Then I had zero amplifiers left and was really really really sad and I was really really really tired.



[I was so distressed and scattered during this whole process  
I took exactly zero photos]

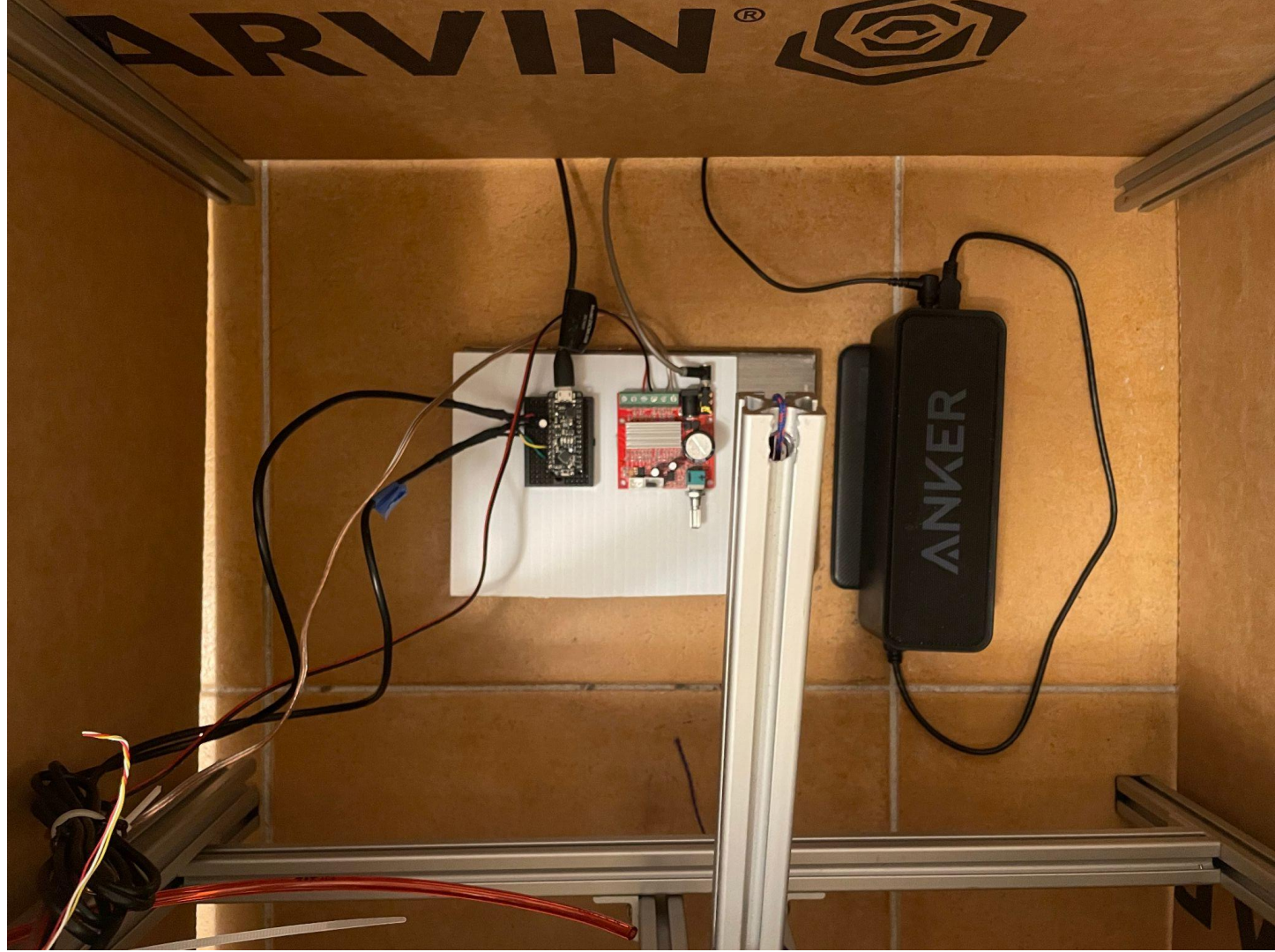
David, of course, saved me. Unbeknownst to me there is a microcenter in Brooklyn and they happened to have a class D amplifier that was an easy replacement. This one even took a 12V input so my battery wiring would be much easier. It was a nice bike ride to Brooklyn!

Once I got the new amplifier I redid my wiring and was back in business. Phew. It only took ALL weekend to accomplish that tiny task. Alas.

Throughout this whole process I spent a bunch of time monkeying around with a raspberry pi and a fancy TFT display David borrowed from work. My goal was to get a graph of the breathing noises to display on the screen to accompany the noise. It was easy enough to port my code to the pi and get the TFT working...but then I ran out of time to make the graph...so it was a bit of a waste in the end.

Here's the final wiring.  
Arduino connects to  
computer and both  
audio cable connect to  
a splitter which goes to  
my computer's  
headphone jack.

Many batteries!



Out of my list of four items, I accomplished three:

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

Then I brought the whole thing back to school for the final presentation. Nothing really unusual happened during the critique and I didn't really have a chance to show the improvements to anyone. Maybe my short demonstration for the class was enough.

Feedback in the critique was pretty similar to before; "the breath noise is effective, but it's best when it moves." I'm not sure what I was expecting, but the lack of surprises was anticlimactic.



Right before everything was due I got to show this to my mom. She thought it was pretty cool. But she basically agreed with what everyone else said - the breath noise was disconcerting, but the actual movement was way more effective. As a doctor, she also told me that I should be saying breath sounds instead of breath noises...oops!

That's the end for now, but there's certainly more to come!

As a random aside, I have a lot of videos of this work playing, not breath sounds, but the album Yankee Hotel Foxtrot by Wilco. Very cool.