Jonathan Gu

Chromacaster

a wearable tech glove

allowing the musician to jack their instrument into themselves

integrating body and performance with music and motion

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Documentation Contents

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Wearables Outside the Gallery

I think I got to the point where I realized that I wanted to live in the future. And that future we're all waiting for, griping on about, isn't really in some far off land or digital screen dimension, the future is tomorrow. It's under construction. We're all moving on that big river, building and shaping our boats.

This is what I mean when I say I want to "expand the equipment slot". Wearables that live with the body. That supplies some facet of function. But what I'm most invested in is creating a new avenue of aesthetic. Clothing with function, if you would. The wearable that is free of the gallery, that lives with the body on the street, has to be durable and efficient. It has to be minimally obtrusive, unbreakable, and for my purposes, look incredibly cool.

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Inspiration/Multisensory Performance

Multisensory Performance

I think one of the greatest avenues of integrated interaction is the technological union of the senses. Interface goes both ways, by bringing ourselves deeper into our cursors but also reaching past the screen and pulling it closer to us. We've really come a long way from Shrek 4D.

I love live performance for the experience it envelops color, sound, motion, and music. One of my favorite venues in New York is Baby's All Right in Williamsburg because of their massive wall of colored lights. A huge inspiration for my pursuit of wearables and modular equipment was my p5js professor Ofer Shouval. He was a true technomancer. Ofer had built a microcontroller attachment for his guitar neck that could control the light wall at Baby's to play his own p5js sketches. It really set my sights on the live music scene being the stage for "garage-punk" wearables.

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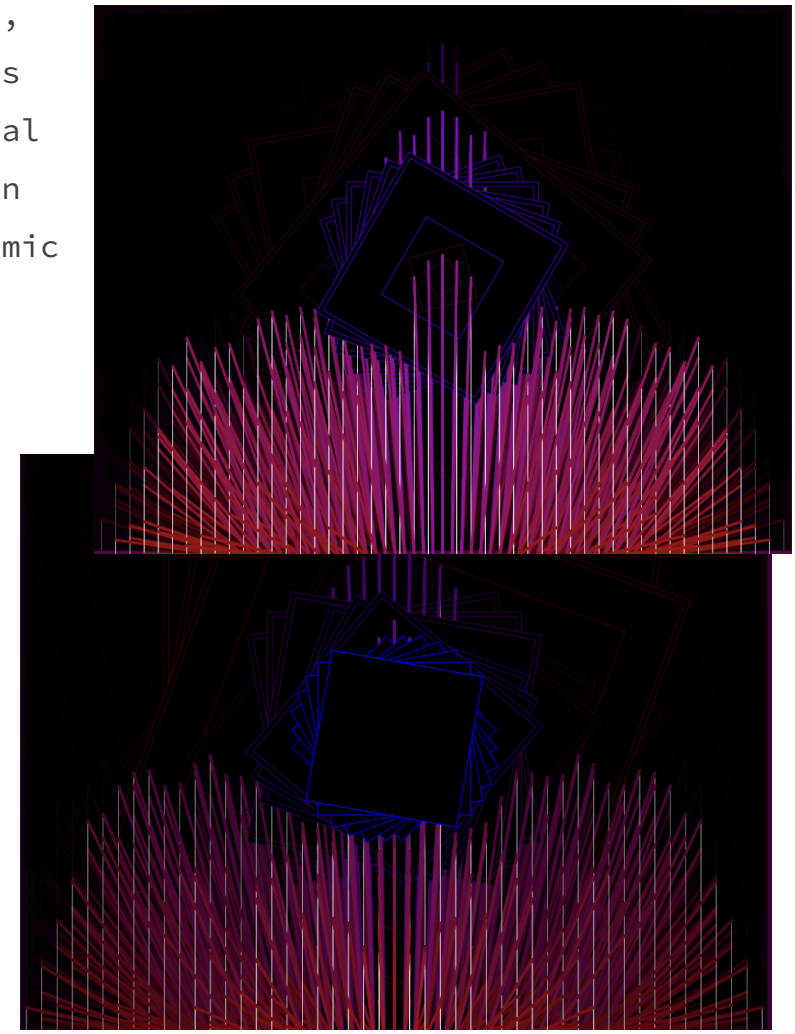
Inspiration/P5js VFX Pedal

P5js VFX Pedal

For the final for Ofer's class, I made what I called a VFX pedal in p5js.

With an audio processor, or in my use case, an effects pedal with a bluetooth digital output, instrument inputs can be read from the computer's mic in. Since the computers' processing power is much stronger than a microcontroller, I was able to use amplitude as well as FFT to create explosive visuals. From this project, I wanted to bring it out of the screen and onto the body.



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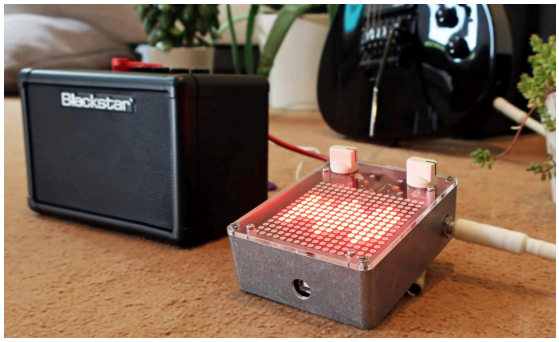
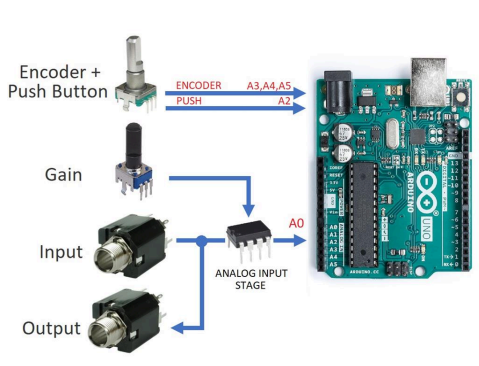
Research/ElectroSmash

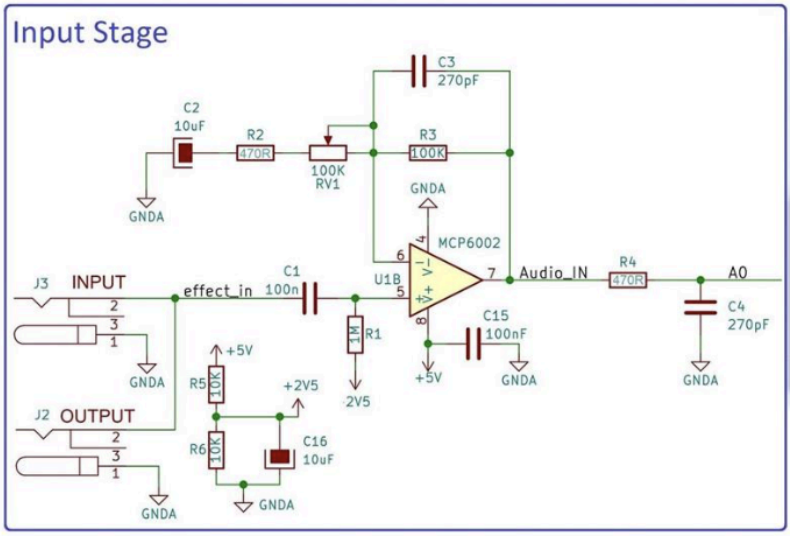
ElectroSmash



https://www.electrosmash.com/arduino-audio-meter

The electronics of this project was largely based on ElctroSmash's "Arduino Audio Meter" build. While they used LED Matrixes, I was mostly interested in how they captured soundwave data from analog ¼inch jacks to a readable level on the arduino.





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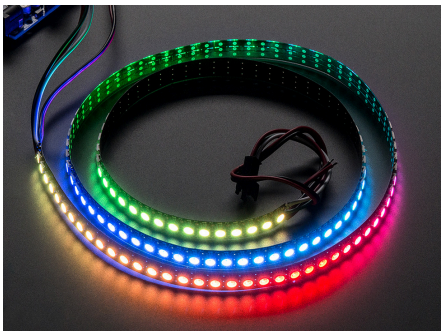
Research/AdaFruit NeoPixels

AdaFruit NeoPixels



Let it be said, AdaFruit is the best. For this project, I initially used a 60/m strip that I had already had. My measured space per strip for the forearm came out to be 6 inches, which meant my early prototype had 9 LEDs a strip, 27 total. I later decided to upgrade to the mythical 144/m strip, 69 pixels total.

I also began considering how I wanted to diffuse my light. I liked the nodes/scales look of an instructables project using flexible printed plastic but ended up setting out for clear black resin printed strips, giving the feeling of obsidian glass.

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Research/Batteries

Batteries

One of the biggest considerations for wearables is space, and batteries are the largest proponents of size and weight. In my early ideation, I ran up against a few powered paths.

- The go-to for cosplayers seemed to be the trusty rechargeable lipo. It was versatile and could be integrated to charge without having to be removed.
- My wearables professor also recommended an external power bank. I liked the idea of something easily changeable, as a live performance setting wouldn't allow for charging downtimes.
- I also stumbled upon a star wars lightsaber building forum where I learned a lot about the 18650 battery. I ended up using it for V1 due to its size and replaceability.

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Fabrication/Bill of Materials

Bill of Materials

Quantity	Part	Type	PPU
0.5	AdaFruit NeoPixel 144/m	NeoPixel Strip	$60
0.5	Medieval Leather Gauntlet	Arm Base	$23
1	Shoulder Brace	Shoulder Base	$9
1	Arduino Nano Every	Microcontroller	$14
0.5	18650 5000mAH	Battery	$16
2	1/4 Inch Audio Socket	Socket	$7
1	MCP6002	Op Amp	
2	10K Resistor	resistor	
1	100K Resistor	resistor	
1	1M Resistor	resistor	
2	470R	resistor	
3	10uF	capacitor	
2	270pF	capacitor	
1	100nF	capacitor	
1	100K Potentiometer	potentiometer	

*0.5 quantity values indicate that I only used half of the total unit. Meaning that I have enough neopixels and an extra gauntlet left over for V2.

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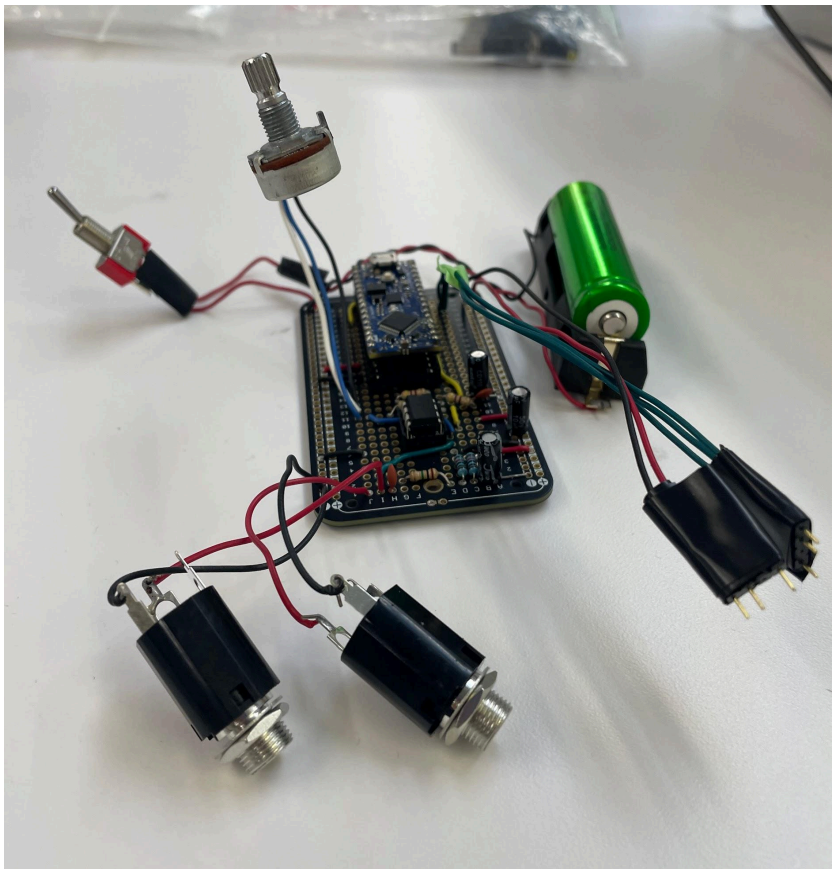
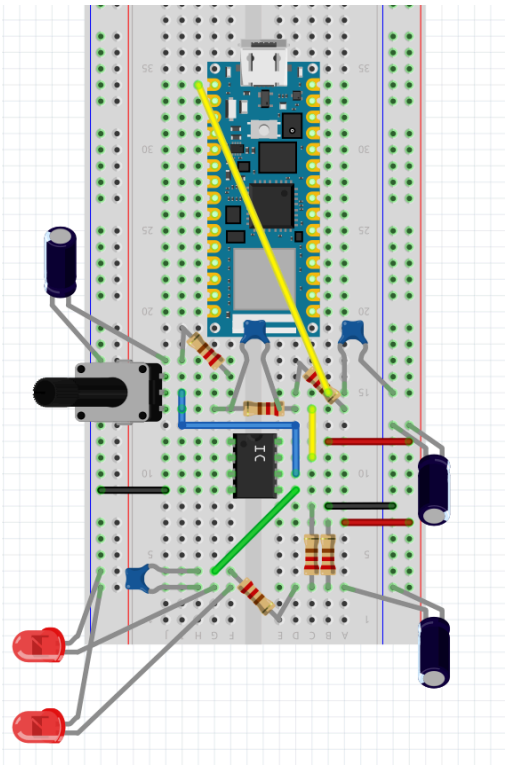
Fabrication/Circuit

Circuit

I mostly built off of ElectroSmash's circuit diagram. In the future, I'd be interested in designing a PCB to further save space and increase security.





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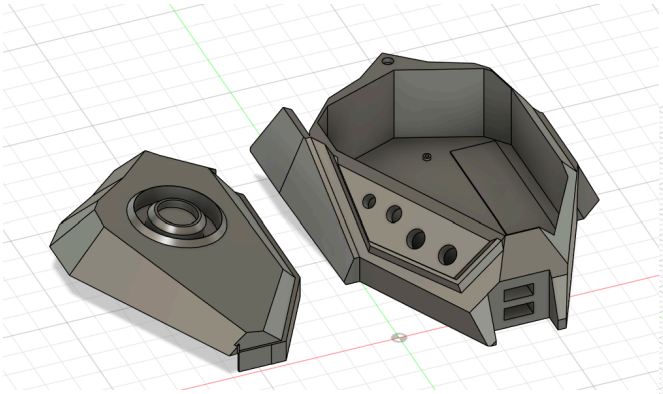
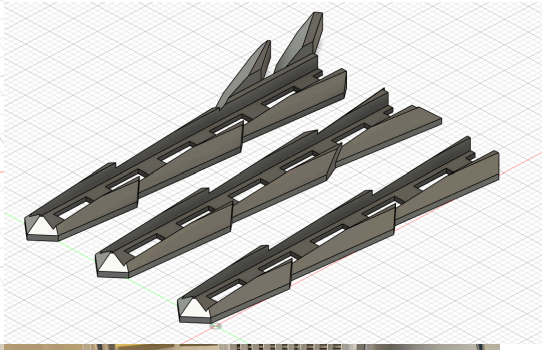
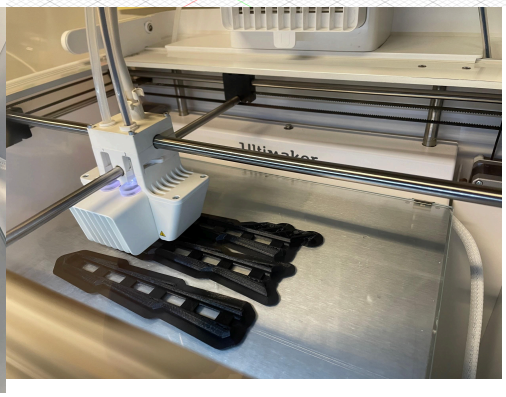
Fabrication/3D Printing

3D Printing

I've done a few projects in Maya and ZBrush, but it honestly felt great to return to CAD software which I hadn't done since highschool robotics. Truly nothing like calipers and constraints. The prints themselves went very smoothly, just standard black PLA on the Ultimaker S5. I did run into trouble with supports getting in the way of some of the more precise channels on the shoulder housing that I had to drill and file out but I learned about dissolvable support material which I'll look into for the future.







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Fabrication/Final Build

Final Build

A few problems that I had more or less anticipated came up as I was putting it all together. I used contact cement to secure the printed pieces to their bases, but the contour caused a few gaps to form. This is addressable by molding the pieces themselves but really would take time that I didn't have. I had also planned to have the gauntlet a separate, pluggable piece from the shoulder, which did not end up happening due to my inability to get jst connectors. I ended up using hot glue to keep the pins in place. This also brought into consideration stress points, which I had tried to eliminate by hot gluing solder joints but could use further

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Version 2/Features

Features

I take it to be a good sign that V2 was in the planning stage all throughout the execution of V1. As is the case with all deadline productions, features and quality of life were the first to be cut for functionality. Like I said before, I had planned for the gauntlet to be a separate, pluggable piece. The other main thing was integrating an encoder to offer control options for brightness and color. I’m also thinking of some sort of snappable battery unit that can be swapped out and recharged. Lot’s to consider and all of which I look forward to working on in the future.