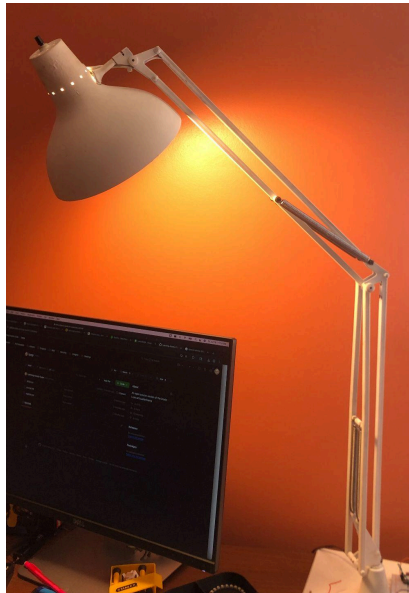


Total Time Spent:



My mind loves mechanisms, joints and anything that moves in a satisfying way. For example I love seeing my 3d printer create a circle, and watching the bed and arm move in coordination to create a perfect ring. Then in my grandparents basement I found this really cool articulated lamp(The Luxo1). At first I just thought it was amazing how many axes of freedom it has for such a simple design. Not only could it move anywhere in its radius but it could do it completely fluidly with no friction. After staring at it on my desk for over a year I decided to give it a

paint job and took it all apart to paint white. Then it sat on my desk for a few months until I learned about Highway.

I was turning in my first Highway project, check it out(<https://github.com/Learning-howto-Code/Nomadic-Notes>) when the turn in form asked me what my next Highway project was. At that moment I looked at my lamp and it just came to me that I should recreate it in order to understand exactly how it works.

I didn't just want to copy it one for one though, I wanted to play with new mediums, to give my lamp a sick futuristic yet minimalist aesthetic- Carbon Fiber(CF) and machined aluminum. While normally found in high tech builds like drones or literally rocket science these materials are surprisingly cheap and really make things stand out.

step/Day 1- Sourcing

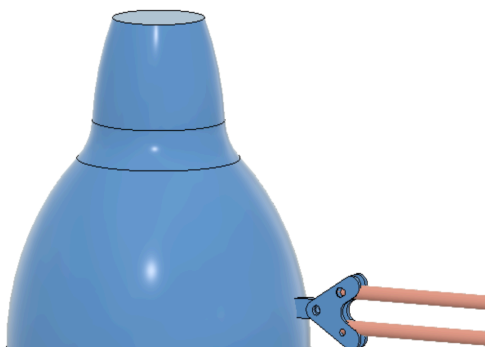
After googling around I learned that carbon fiber **rod** is much much cheaper than hollow carbon fiber tube, at least for small diameters. This is fine with me, since weight is a minimal consideration. I decided to go with Dragon Plate carbon fiber as they seemed like a legit supplier, but also had the cheapest selection. For the Laser Cut aluminum brackets I decided to go with SendCutSend as they are made in the USA and sponsored by a Youtuber I love (inheritance machining). Their quotes are actually quite reasonable, with one of the brackets being only \$2.5. For the rest of the hardware I just sourced it from McMasterCarr, they are an awesome resource for any piece of hardware, plus they have CAD models that are built straight into Fusion 360. While not the cheapest, most of their components can be found at other retailers for much cheaper. So what I do is source from mcmaster carr, then when I'm building my BOM I source a very similar component that is cheaper, often at the expense of options or longer lead time, which I'm fine with.

Time- 2 hours

Step/Day 2 - CAD

The CAD for this project was a little hard, since I had to copy all of the geometries from the original Luxo lamp and how each rod would connect to the brackets. Since I'm not using metal like the original I first thought of using rod end clevis as they would allow me to bolt perpendicular to the rod while still letting the rod rotate. I was actually planning on using these, until I started copying the geometry from the Spec sheet into fusion and realized how bulky they are- not what I want. The reason I had gone with the clevis's and not just boring a hole in the CF rod was for durability, but I realized I could just use a bushing to protect the CF weave. I sourced

a 4mm teflon bushing from McMasterCarr, which would come back to bite me since the outer



diameter was really small(5.5mm). Once I had the bracket geometry and figured out how to connect the rods to the brackets I just layed out all of my rods in the same way as the Luxo, along with the springs. For the lamp shade I decided to 3D print it, as it would cost like \$5 of material and hugely wasteful to a machine with subtractive manufacturing. Again I just copied the geometry from my lamp.

Time spent: 3 hours- I never said I was good at CAD

Step/Day 3 - Electronics

This wouldn't be a Highway project without some sick electronics. While there are no RGB LED strips on my lamp, there are definitely some LED's. My Luxo gets really really hot, since it has an incandescent bulb- like burns you hot. I can't do that, since the PLA would literally melt. Instead I am going to use a LED bulb (yes I know I can put that in mine). For ease of use and longevity I am just using a standard light bulb that is in almost all lamps, that way you can pick your color temp. Or just use the one on hand.

Just because I put an LED light bulb in it doesn't mean it has electronics so I decided to bring my Luxo into the 21'st century. I'm addicted to esp32's, they're just so OP, so I put one in my Luxo. To control the LED I am using a capacitive touch button concealed under the last layer line of the 3d print, connected to the GPIO's on the esp32. I've never used capacitive touch, and this seemed like a good way to keep my lamp sleek and use a new component. Line voltage would blow up the esp32 instantly though, so I am using a 120v to 3.3v relay. This way I can control the LED really easily.

That wasn't enough though, so I made it smart. Homespam is an awesome library and an example of why I love Esp32's. They can do anything. This library lets you add an ESP32 or really any microcontroller to your Apple Home, so I can control my lamp with Siri! When I

toggle the state in the Home app it just sends a command to the esp32 which will change the status of the GPIO connected to the relay.

Estimated Time: 1 hour

Step/Day 4- Coding

This project doesn't take a lot of code, and since I have already used homespan before it was pretty simple. Basically it just reads GPIO's for the capacitive touch button and writes to GPIO's for the relay. The capacitive touch button also changes the state of the lamp in the home app.

Time Spent- 45 minutes

Step/Day5 - Submitting

This is my second Highway project so it took not nearly as long to submit. I just went to [Highway.hackclub.com](https://highway.hackclub.com) and followed the guide. Well I guess this is the end. If you read to the end you're awesome, and if you even looked at my project thanks a lot. I spent a ton of time on it and am very passionate about it.