Zachary Sherman

A few of my projects...

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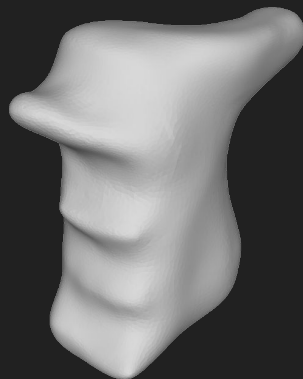
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Ergonomic Camera Control - Inspiration and Design

As an amateur videographer, I love experimenting with new camera rigs and parts. When I happened upon an ergonomic camera handle being sold online for nearly $100, I decided to build my own instead.

About a year later, when I was using my 3D printed handles, I realized they would be much more useful with integrated buttons to control my camera. Using Meshmixer and Onshape, I made the handles hollow and added precise cutouts for focus, record, aperture, and ISO buttons.
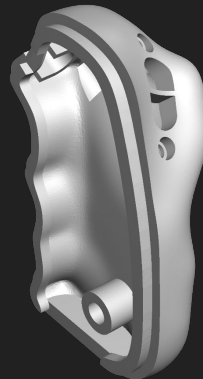

I started by tracing images of each side of the handle, then intersecting extrusions of each traced side.

Having never used organic modeling tools before this project, Meshmixer's learning curve was steep. It took many hours to carefully smooth the handle, but after three 3D printed iterations, the handle fits naturally in my hand.

I used Meshmixer to shell the handle, then Onshape's more traditional CAD features to add cutouts for buttons and screws.

Images at right: SmallRig.com

Ergonomic Camera Control - 3D Printing and Electronics

Using a series of test 3D prints with low infill, I determined that the pieces of each handle fit together properly and that the buttons and ESP8266 microcontroller I planned to use fit well into their respective handles.

I 3D printed the final handles with glow-in-the-dark filament using high infill for strength, then used short lengths of wire to connect each button.
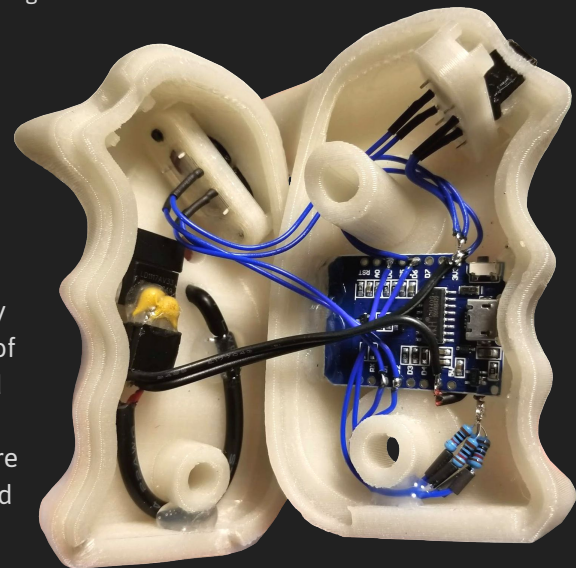
◄ The final right side handle with buttons installed

▼ The final left side handle with ESP8266 and voltage regulator installed

▲ Before removing support material from a test print

▼ Test prints helped me ensure components would fit as I expected

While testing the tactile buttons, I noticed they were repeatedly being pressed. After a couple of hours of frustrating troubleshooting, I realized my mistake: I had soldered leads to pins that were always connected, rather than pins that are connected when the button is pressed. I learned to always double-check my connections!

Ergonomic Camera Control - Finished Product

I am very happy with how this project turned out. Because the handles allow me to hold my camera in a more comfortable way, the footage I shoot is smoother. Additionally, the camera controls on the handles make it very easy to change settings on the fly.
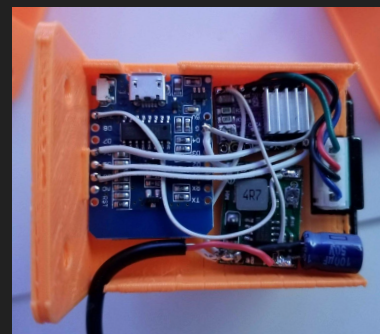
I learned a lot about organic modeling, camera control protocols, and electronics during this project. I am excited to use these skills on future projects!
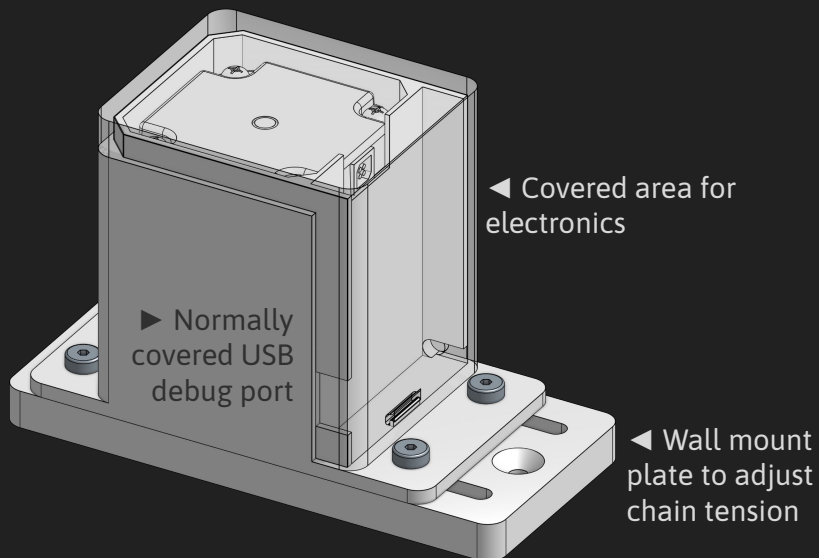
Motorized Shades - Current Progress

I love using smart home products and setting up home automation. Living in a dorm gives me the perfect opportunity to test different smart products, but smart shades are still very expensive for what they offer.

This past summer, I began working on my own smart shade solution using a stepper motor and a wifi-enabled Arduino. Although I am still working on this project, I hope to complete it in the next few months.

Before and after wiring

◄ Covered area for electronics

► Normally covered USB debug port

◄ Wall mount plate to adjust chain tension

Testing the device for the first time. It was mounted to a water pipe, so it will be much quieter in the future!
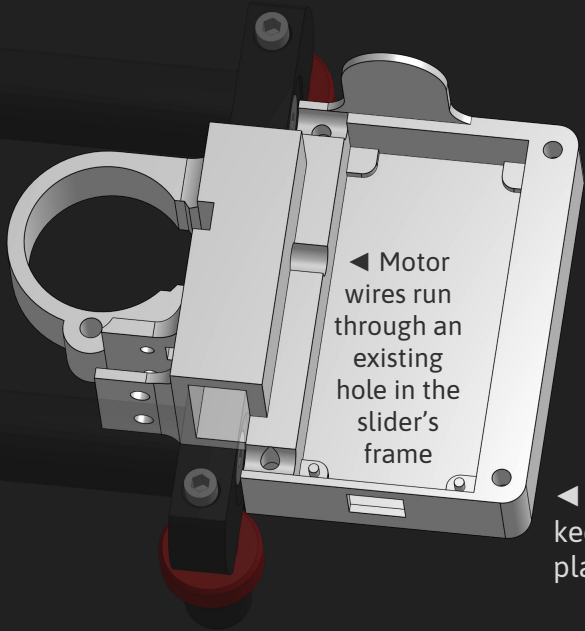
Camera Slider Motorization - Inspiration and Design

Camera sliders allow videographers to take very smooth pan shots. Since I already had a manual slider, I decided to motorize mine rather than purchase one of the many commercially-available products.

Using a small stepper motor, a belt salvaged from a printer, and other inexpensive components, I built a quiet and capable motorized camera slider for videography.
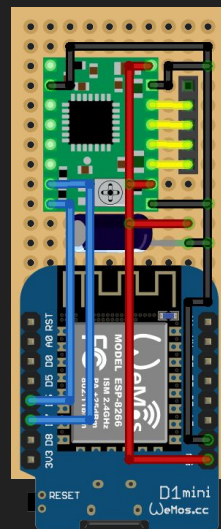
Image: RhinoCameraGear.com

Fitting the motor and limit switch between the slider rails was a challenge!

◀ Motor wires run through an existing hole in the slider's frame

◀ 3D printed pins keep the perfboard in place with a friction fit

▶ Components are soldered on one side of the perfboard, and wires are routed on the other
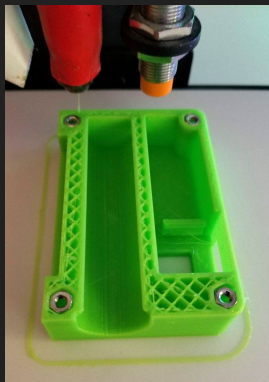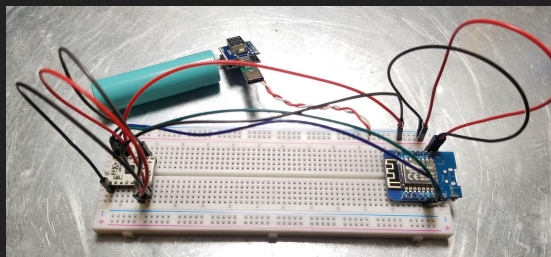
▼ Belt tension is adjustable with one screw

Camera Slider Motorization - 3D Printing and Electronics

Because the motorization mechanism is integrated with the slider, it must be assembled in a very specific order with tight tolerances. Many test prints helped me ensure all the pieces fit together properly. Using metal nuts embedded in a 3D printed part allows the mechanism to be repeatedly assembled without wear. I 3D printed the final mechanism parts with black filament.
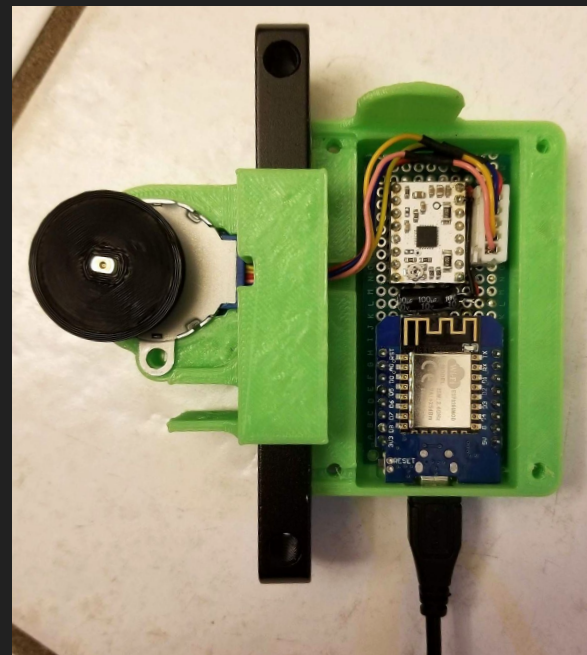

◄ Embedding nuts while a 3D print is paused

▲ Testing electronics

▼ Final test of the lower part of the enclosure
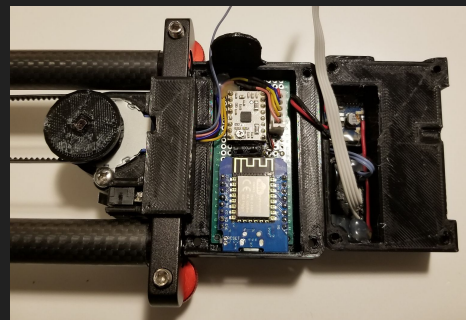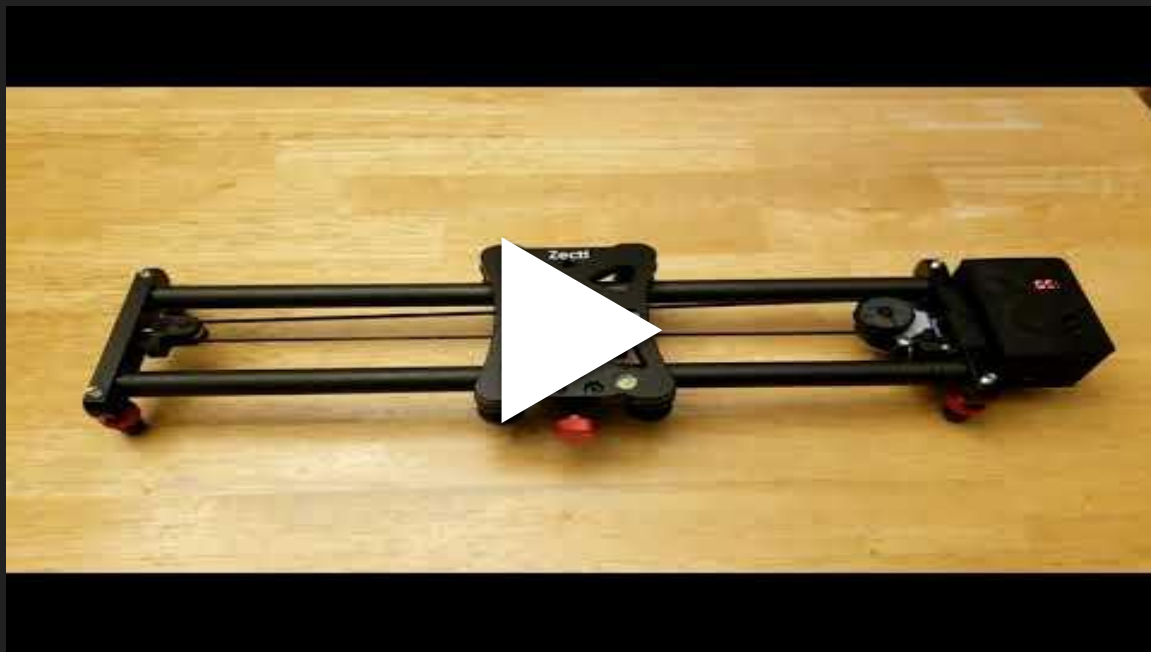

▼ The assembled mechanism without electronics
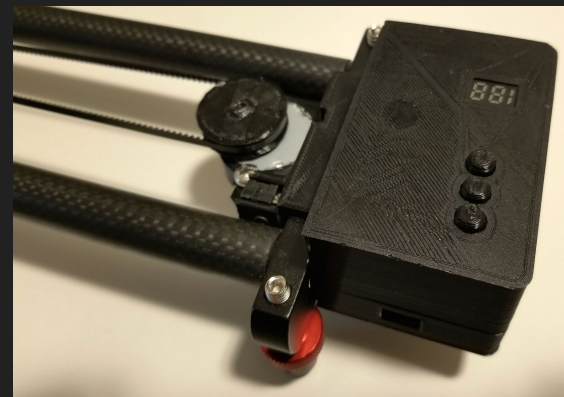

▲ Testing movement before building an enclosure

Camera Slider Motorization - Finished Product

Overall, I am happy with how the hardware for this project turned out. The motor has enough torque to slide my camera, and it is nearly silent. The perfboard circuit is neat and compact, and the power bank parts supply plenty of power to the slider. The slider retains its full range of motion.

I am continuing to work on software for the slider, including designing a web interface to control it. I am also working on a better way to control the slider from the unit itself.

Assorted CAD Models

During my two internships at Onshape, I made many highly detailed 3D models to improve my CAD skills.
I also became a Certified Onshape Associate and a Certified Onshape Professional.

Click any model to manipulate it in Onshape.

Thank you for viewing my portfolio and considering my application.

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