Ian Hartwig

Team B: No Name

Teammates: Ian Rosado, Stephanie Chen, Trevor Decker

ILR 05

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Individual Progress

In the last week, I primarily worked on the design of the extension arm so that we have something to control with our control system. This will complement my other work on the advanced IO since we will have motors to control. In order to save a significant amount of weight while using a large gear reduction and motor we would like to have a single motor in the center of our design. This requires a gearbox that can move power between 2 horizontally moving shafts while under torsional load. As seen in figure 1, this gearbox is connected to a 1:40 vex planetary gearbox. Through some empirical observation we found that hex broached gears can slide on aluminum hex shaft under load. Using a larger surface area seems to help support more torsional load. We then have a 3mm pitch HTD timing belt connecting the pulleys.

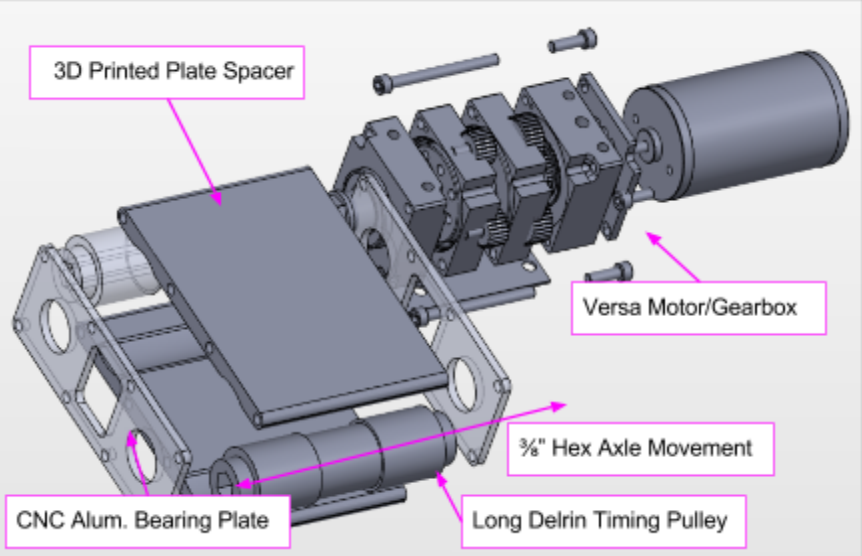

Figure 1: Embedded System Bring Up

Challenges

The gearbox design above is great in model land, but it contains a number of non standard components. The plate spacer could be made of ¼" aluminum plate, but there would be a considerable amount of wasted weight, and we are extremely weight conscious for parts that are on the arm. In this situation we plan to 3D print the plate since the dimensions do not matter, and 3D printed parts exhibit good compression strength compared to weight.

It is also unfortunate that timing belt pulleys, especially in small sizes, do not come as 3 ½" wide. We also don't have on campus or have the budget for a ⅜" hex broach. In this case, we chose to cut profiles of the pulley out of many layers of laser cut delrin. We ordered some test material (which turned out to be HDPE, not delrin) to try and cut the timing belt geometry, but this material just melts. The results can be seen in figure 2. In lieu of having the correct material, I cut the geometry out of acrylic for testing, as seen in figure 3.

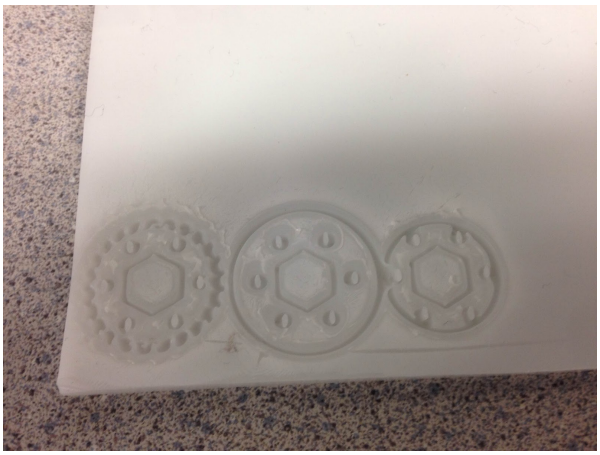

Figure 2: HDPE does not laser cut well.

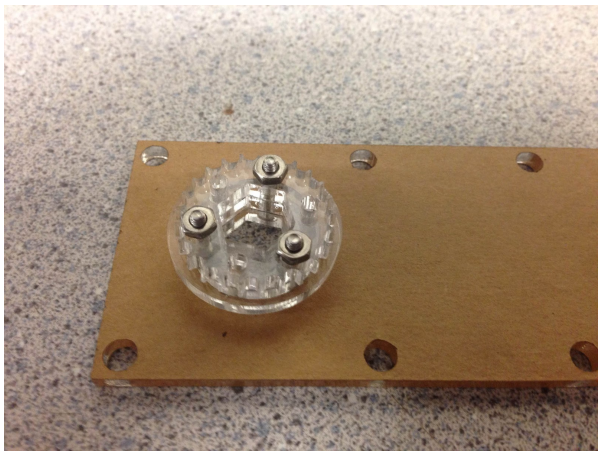

Figure 3: Acrylic test cuts for geometry.

Teamwork

Ian Rosado and Stephanie Chen continued to work on the prototype gripper. They have run tests for how much weight the current gripper can support, which is currently not enough, and they are investigating options to make it hold more load. One of the options is to change the material on the inside of the gripper that contacts the frame. Another option they are investigating is to change the angle that it is gripping at. They have also started to machine other components as designs become available. Trevor has been working on the design of the cleaning unit and on a string potentiometer.

Plans

We plan to machine more components since all of our parts are designed now except for the cleaning unit. I have been tasked with making and reviewing parts that need to be laser cut. Several parts of the extension arm and pivot gearboxes still need to be cut out of delrin. I will also be assisting Trevor with continued design and prototyping of the cleaning unit, which may require laser cutting out of acrylic.