

Ian Hartwig

Team B: Monkey Bots

Teammates: Ian Rosado, Stephanie Chen, Trevor Decker

ILR 07

April 1st, 2015

(April Fools'!)

Individual Progress

In the last week, I primarily helped manufacture and assemble parts that we have already made for the extension and pivot modules. Trevor also needed some assistance with design review and assembly of the cleaning module.

The pivot gearbox is an essential component to our design. It allows us to turn the entire robot on a gripper under full load and extension. This, as calculated before, could be up to 80Nm of torque without safety factor. This gearbox was designed to use steel and brass gears that are bought off the shelf. However, we needed to add a six hole pattern to the brass gear and a key slot to the steel worm. This can be seen graphically in figure 1. While we were able to assemble one of these gearboxes for demo and testing, there were multiple learning points as I will discuss in challenges.

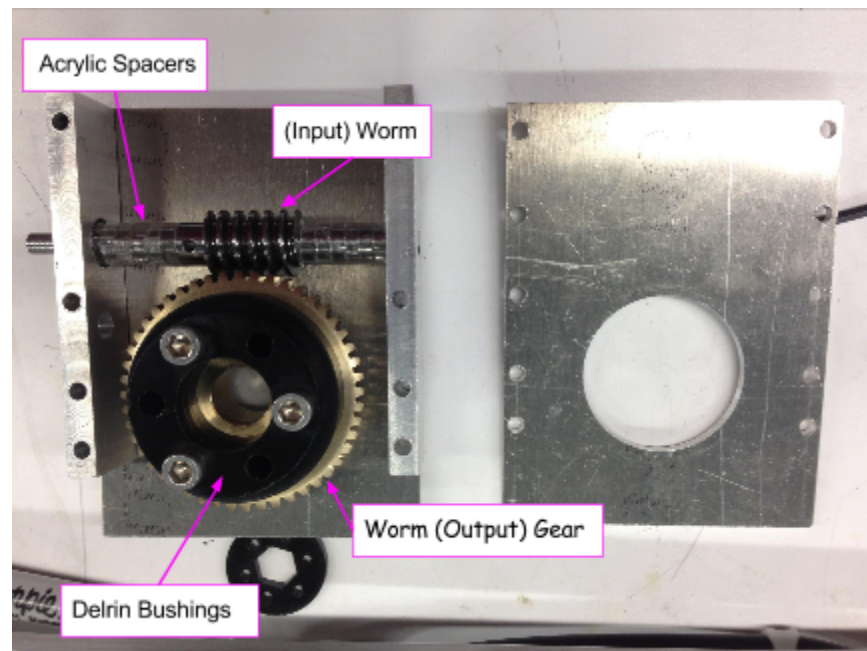


Figure 1: Disassembled pivot gearbox.

Challenges

Making the last few parts of the pivot gearbox proved to be especially time consuming. We needed to put a 6-hole mounting pattern in the output gear of our pivot gearbox, but the robotics club does not have a rotating table for the mill that has the proper chucks to hold our gear in the center. We were able to find the right equipment in the Robotics Institute shop. However, the table they had would not fit on any of the mill tables in their shop in a way that it could be bolted down. The rotation handle extended below the mounting surface so that it had to hang off the edge of the table. Our solution was to prop the chuck up with spare flat stock. I also needed to cut a (quick) custom shim to

allow us to drill through holes without damaging the chuck. The resulting assembly can be seen in figure 2, below.

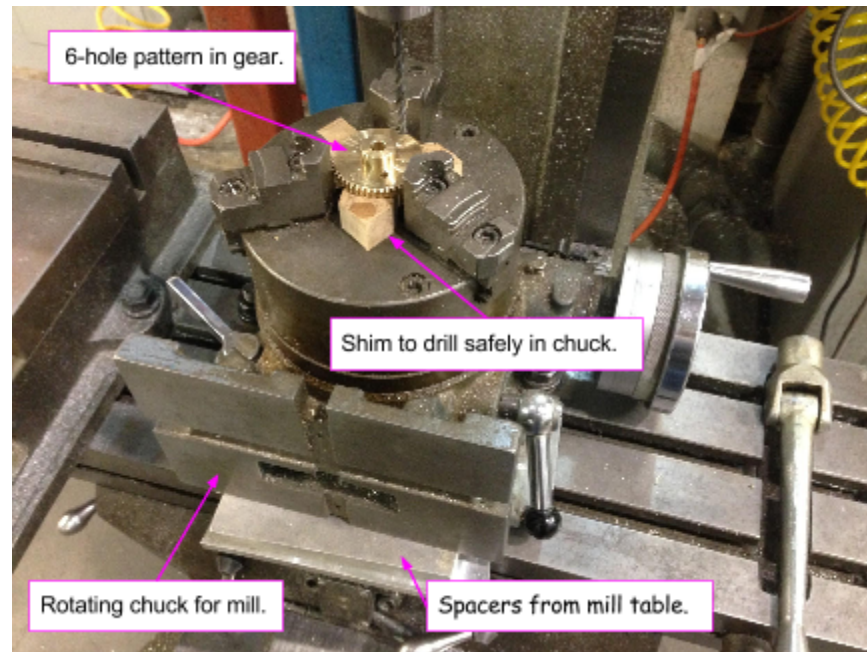


Figure 2: Setup to properly drill a 6-hole pattern.

We also suffered setbacks in other parts of the gearbox. Since the delrin we got is slightly oversized (thicker than expected), the gearbox size plates could not be screwed tightly to the bearing blocks without making the output gear bind. I cut some quick spacers for the top of the bearing block to fix this. We also cracked one of our worms when trying to put a key slot in it. This will require us to order another gear and reconsider how we cut the slot a second time.

Teamwork

All 4 of us met both days over the weekend to machine parts all day. This resulted in a lot of progress, as showcased in our demo. Trevor focused primarily on the cleaning unit design so that we can iterate on that quickly. Stephanie, Ian, and I focused on making final parts for the pivot and extension arm including bearing blocks, shafts, and gears.

Plans

We plan to order and manufacture the parts required to put together the 2nd side of the pivot module very soon. These designs have been proven. We also need to replace some acrylic components of the pivot gearbox that snapped during testing with metal components. As a whole, we will be improving our cleaner and revising the gripper. I need to bring up some of our control electronics with Trevor.