Ihsane Debbache

Team F: ADD_IN

Teammates: Nikhil Baheti, Dan Berman and Astha Prasad

ILR03

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I - Individual progress

My goals this week where mainly to study common nozzle designs, to help Nikhil designing our first iteration and to order the materials necessary for the machining. I also looked at some rotary stages that would correspond to our system and started thinking on how to mount the rotational joint together, which also happens to be my CAD assignment's part 3.

1.1 - Hot end design:

In our first hot end design, we will try to keep it as close as possible to the current one. So we studied the Makergear V3B hot end and got the cad models for it. From that I gathered that the simplest way to design and machine our first the hot end is to just machine the heat block, and buy a nozzle that already has a threaded barrel long enough to be screwed directly in the new heat block, and also a smaller cone angle. This is important because the nozzles are hollow inside, making them easy to break, so machining on one is likely to fail, and machining one from scratch is costly. We thus acquired the nozzle tip shown in figure 1.1. And we also got some barrels that are shown in the same picture, we might only need to cut them shorter to account for the nozzle thread, which is easy to do. I also bought the aluminum rods to machine the heat block, so we are now ready to start, and should be able to start testing our first bent hot end by next week.

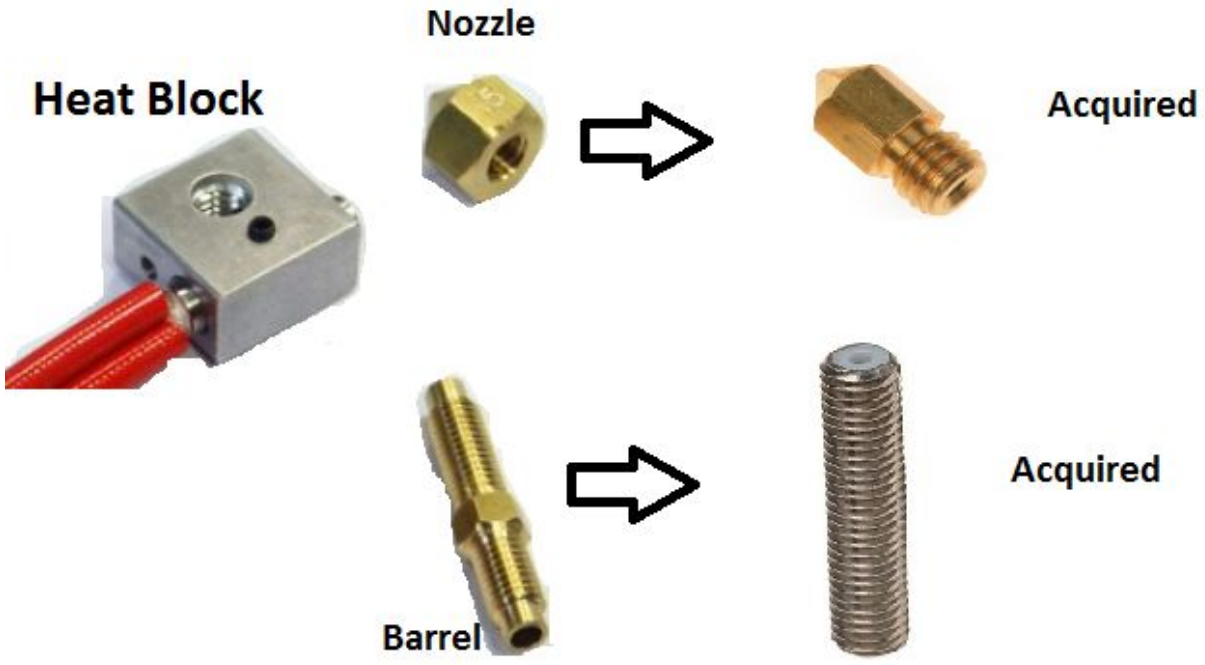

Figure 1.1 Hot end current parts on the left and parts bought for the new one on the right

1.2 Designing the rotational joint:

For this part I had to think about how everything is going to fit together in our printer. Figure 1.2 shows a preliminary design of the joint. Since we are rotating, we need to use a slip ring to transfer the lines of the heater and thermistor, the rotary stage and slip ring are exploded in the figure to be visible, but this is all preliminary because we have yet to select a definitive slip ring and rotary stage. And to prevent the noise of the slip rings from affecting our thermistor reading, Dan designed a board that will transform the analog lines to digital, which will be our PCB assignment. That board will be mounted right below the slip ring and is not displayed yet because we still have to design it.

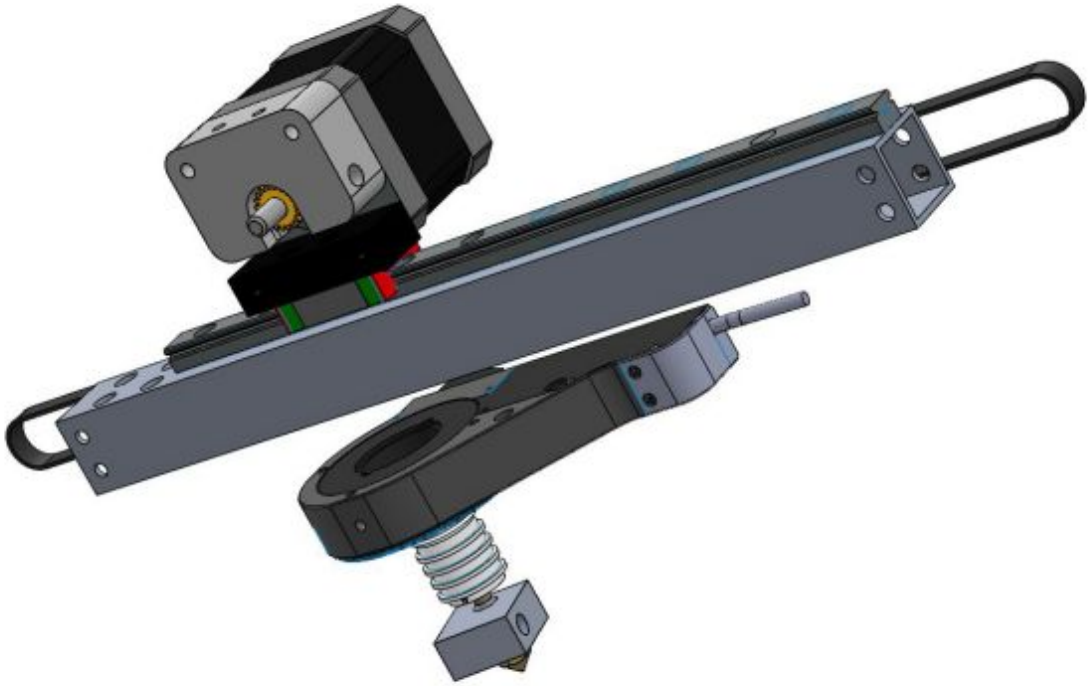

Figure 1.2 view of the rotational joint components

Some parts are also missing, mostly between the rotary stage and the extruder. Since it is complicated to draw it's smarter to spend time on these after selecting the rotary stage, we will then design and 3D print the mount for the rotary stage to also slide on the track, and to be fixed with the extruder.

1.3 Some interesting rotary stages:

I also looked for rotary stages and requested many quotes for interesting models. Finding a stage that has the speed, precision and weight we are looking for is proving to be challenging, and we have to invest some time into it. The figure 1.3 shows some candidates:

Figure 1.3 a) JVL HDCT-100 Rotary stage b) PI DT-34 rotary stage

c) Thorlabs PRM1Z8 (used in the CAD drawing)

II - Challenges

The challenges that were faced this week where mostly related to the nozzle design, basically figuring out what would be easy to machine and what would be hard, which is not always clear at first glance and is all new to me. Dan, who is a mechanical engineer and worked as a machinist, greatly helped me with that, so that we came up with a part that can be rapidly machined. The joint assembly was also very challenging since I am new to solidworks. But a lot of resources where available online which helped greatly.

III - Teamwork

During last week, we each worked on our respective parts, Astha improved the layer selection code in Matlab to make it more robust, and also include the configuration file. Dan made progress on the Slic3r and also advised us on the nozzle design, and Nikhil made the solidworks files for the nozzle, and also as PM, supervised the system's engineering process, where all the team worked on the second presentation for the system's engineering class.

IV - Future Plans

The future plans for the next two weeks are to work on the PDR during the first week, and throughout both weeks, we will machine the nozzle at the shop, we have the design and materials ready. We will also research an appropriate slip ring and rotary stage, and work on the PCB, which is also our PCB assignment. On the software side we will research the path planning algorithm, set up our GitHub and verify if pronterface, the printer interface software, can transmit the 4DoF G-code without giving an error message.