PROGRESS REVIEW 4

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Team F / ADD_IN

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Individual Progress

For this week, my personal goals included the following:

- Eliminate the filament trail that forms while going into insertion layer

Filament Trail

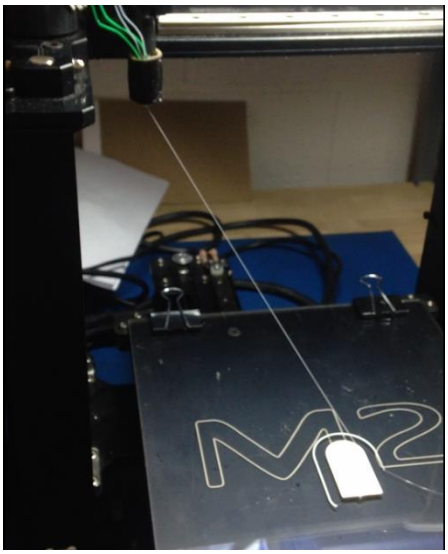

Figure 1: Filament Trail

With our MATLAB script, we were able to generate modified G-code that included pause sequences at user defined layer heights. Every time the printer reached the insertion layer, it was commanded to move into its insertion configuration. This involved rolling the bed all the way out and pushing the nozzle to a safe position at the back. Although this ran smoothly, it caused the nozzle to leave a trail of thin filament as is shown by figure 1. This filament would remain attached to the printed part, leaving an unwanted thread protruding from the final print. In order to address this issue, we decided on 2 approaches:

1. Adjusting the print temperature
2. Modifying the pause sequence at insertion layers

Temperature control

The standard temperature that we had been working with was 220 degrees Celsius. We decided to reduce this temperature to 210. On testing, we found that the extrusion remained smooth at this temperature.

When the fans were reattached, we found that we were unable to control the speed of the fan using the usual ‘M106 S(0-255)’ command. The fan would only run at its maximum speed. This proved to be more time consuming than helpful since the fan would inhibit the heat block from achieving its set temperature.

Modifying Pause Commands

In our earlier implementation, the nozzle would take a diagonal path to its safe configuration, as shown in figure 1. The command was:

```
G1 X0 Y200 Z170
```

This trajectory was altered using the following command:

```
G1 X0 F7800
G01 Y200 Z170
```

This enabled a rapid movement in the z direction, followed by gradual movement in the Y and Z direction.

Result

A combination of reducing the print temperature and altering the pause trajectory successfully eliminated the filament trail issue.

Challenges

One of the challenges we faced this week was with controlling the fan connected to the extruder. The fan, when connected, runs only on full power. As a result of this, the fan at full speed would inhibit the heat block from reaching its set temperature. In order to mitigate this issue, we took the following measures:

a. Supply the heater with 24V as opposed to the 19V it was using previously
b. Increase the Kp of the PID controller

This problem with the fan still persists. However, since we were able to fix the filament trail issue, the fan's function is not critical to the project as of now. We hope, however, to fix this issue in the spring semester.

Teamwork

The team split up the tasks in the following manner:

Daniel Berman

Dan was in charge of fixing the fans back onto the 3D printer. On connecting the fan however, it would only work on full power and we were not able to control its speed. At the moment, we believe this is due to a blown MOSFET on the board. However, since the G-code alterations were able to eliminate the filament trail issue, installing the fans are no longer critical at this moment.

Ishane Debbache

Ihsane was responsible for ordering the slip ring and hollow stepper motor, as well as designing the mount for the new extruder-nozzle set up. He put in many hours of research into finding an appropriate hollow stepper motor.

Nikhil Baheti

Nikhil was in charge of digging into the merlin firmware on our RAMBO board that drives the printer. He is now able to drive the 4th stepper motor by a certain angle by parsing the appropriate commands through the printer interface software, pronterface.

Future Goals

Over the next few days leading up to the FVE, we will be focus our attention towards calibrating our printer such that it works smoothly. As we have been tinkering with it for almost a semester, we have made many adjustments to the firmware and hardware itself. Some examples include:

1. Setting the end stop of the Z axis to the correct position
2. Adjusting the gain values for the PID controller that heats up the aluminum block

I will be focusing on ensuring that the software that is used to generate the G-code is robust and functions in all corner cases.