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**Chocolate 3D Printer Improvements Proposal**

The chocolate 3D printer my group built for senior design turned out very well. However, some changes could vastly expand the capabilities of the 3D printer.

**Proposed Improvements**

The first goal is to improve the printing capabilities of the 3D printer. Currently, the control software on the printer limits it to basic geometries. It can print a 2D design and repeat that pattern over multiple layers but cannot print true 3D shapes. Switching to more sophisticated software would remove this limitation.

The second goal is to improve the thermal management of the printer. Prints currently require significant wait times between layers while chocolate cools. Adding cooling fans would eliminate this wait. Additionally, a cooling setup would enable the printing overhangs without supports (ideally around 45-50 degrees) and bridges (ideally an inch).

The third goal is to make the user experience comparable to a commercial 3D printer. This can be achieved by adding a user interface (a screen and a control knob) and an SD card reader. These changes would put the user interface on par with many commercial 3D printers. Documentation can also be created to walk a person with limited knowledge through printing a gcode file stored on the printer, and creating their own gcode files to print.

The fourth goal is to expand the chocolate types the printer can print with. This can primarily be achieved through tuning software profiles, but tweaking the internal geometry of the extruder (trying different gear profiles for the gear pump) may also improve printing results.

**Cost**

An approximate cost of these proposed changes would be $200. A breakdown is shown in the BOM below. 3D prints are not included, and some components - namely fan ducts and a revised hot-end mount - would require 3D printed components. A replacement ball screw is also included since the current ball screw is broken.

**BOM (Based on Amazon pricing)**

|  |  |
| --- | --- |
| **Item** | **Cost** |
| **Software** | |
| XYZ limit switches | $15 |
| **Cooling** |  |
| Cooling fans | $20 |
| **User Interface** | |
| Screen | $20 |
| SD reader | $10 |
| **Misc.** | |
| Materials to fabricate brackets | $40 |
| Assorted nuts & bolts | $40 |
| Replacement lead screw | $15 |
| Chocolate | $40 |
| **Total** | **$200** |