3D Printing Overview

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Outline

Introduction

While this presentation primarily focusses on consumer grade (Fused Deposition Modeling) FDM printers, much of it applies to other printers. There are three basic stages in the 3D printing pipeline.

- 3D Modeling
- Preparing for Printing
- Printing

3D Printing Pipeline Overview

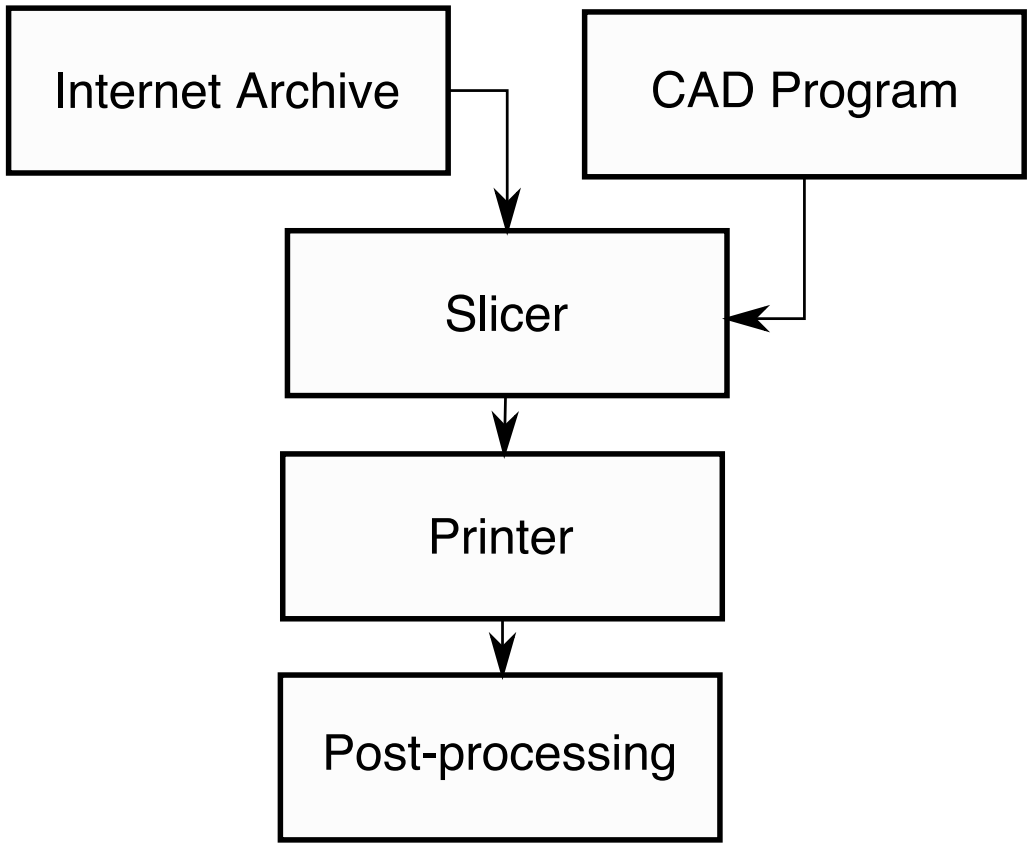

Figure: The 3D Printing Pipeline

3D Models

To print a 3D object, you first need to get a 3D model. There are a couple of ways to do it.

- Use an existing model
- Design it yourself (or get someone do design it for you)

Existing Models

- There are a number of sites on the web where you can download existing 3D models for free or for money. A couple of the more prominent free sites are Thingiverse (https://www.thingiverse.com) and MyMiniFactory (https://www.myminifactory.com). If you have something specific in mind, try using a search engine to find a model.
- On the other hand, you may have already created the model, in which case, just follow the design it yourself part of the process.

Design it Yourself

- If you can't find the model you want, are good at 3D modeling, or want to learn 3D modeling, you can try designing it yourself.
- There is a vast number of free and pay CAD packages. Try to find one that suits your needs. I use a program called OpenSCAD (http://www.openscad.org), some people use Blender (https://www.blender.org), others, any of a variety of other programs.
- If you don't already have a favorite, download several of the free ones and try them to see which one you like. The right one for you will depend on how your mind works and what sort of things you want to design. The right one for you is not necessarily the right one for me.

Getting Ready for the Next Step

- Since each CAD program has its own file format and stores information that it not needed for printing, your 3D model needs to be converted to a standard format.
- The thing about standards is that there are so many to choose from.
- The most common one is ".stl". Many, if not most, downloadable models use it.
- Just make sure that the next step will accept your chosen format.

Preparation for Printing

- Once you have your model in a standard format, it needs to be converted to a form for your printer and print job.
- This applies information that is specific to your printer and the material that you are printing with.
- You can also select print specific parameters like resolution or supports for overhangs.
- The program that does this is called a slicer.

Slicing

- The slicer program converts the 3D model into a series of instructions to the printer.
- There are a number of slicers available–check with your printer manufacturer to see what they recommend.
- Your printer manufacturer may provide their own slicer or settings that can be used by another common slicer.
- The output of the slicer is specific to the printer and the material being used.

Printing

- Load the sliced file into the printer and press “Start”.
- The printer manufacturer should provide instructions for using their printer.

Post Processing

Depending on the printer and the use for the object, some post processing may be required after printing. This can include things like machining, sanding, chemical washes, and removal of supporting material. These are done to improve the surface finish, attain proper dimensions, cure material to improve durability, or remove extraneous material.

Final Thoughts

- This technology is still in its infancy so things are changing quickly.
  - There are apparently 3D printers that can print a house out of concrete.
- There are probably exceptions to everything said in this presentation.

Glossary

g-code A common instruction set for numerically controlled machine tools. Also commonly used by 3D printers.

FDM Fused Deposition Modeling–a popular 3D printing technology

slicer A program that reads a standard 3D model and produces specific instructions (typically g-code) for your printer.

.stl A standard file format for 3D models. Originally it stood for "stereolithography", but since then "standard triangle list" and "standard tessellation libary" have also been advanced as the meaning, but for our purposes, it doesn't really matter.