Project 2 - Explore Additive 3D Modeling / 3D Printing
Assigned: Monday, February 5
Due: Wednesday, February 14

Abstract:
Similar to Project 1, this assignment is to experiment with 3D printing technology and the conceptual process of additive, or layered, 3-D construction.

3-D printing is a unique technology in the realm of CNC. Often this technology is referred to as Rapid Prototyping as its functional use is often one of (relatively) quickly producing a physical object from a CAD design model. This object can be used to test “form, fit, and function” prior to building the object in its real material, which likely costs more in time and material stock to produce. As a prototype, this object is fully (exceptions below) workable and functions to test both visual and engineering specifications, as well as completeness, correctness, and overall design integrity.

The production approach is so simple that it is almost not even worth consideration. Take your 3D model, run it through some software, and hit “Go”. A few hours later, wa-la – it’s done.

There are two important flaws in such a singular approach:
1. There is only one material, and it’s likely not the material that you will ultimately produce your design with. Every part is made of a monolithic, homogenous plastic. There is absolutely no sense of materiality, so the prototype cannot be true.
2. Letting the machine handle everything may be easy, but leaves no room for control, or more interestingly innovation, of the process. You get the part. Done. This may be good for some applications, but I’m interested in pursuing something more subtle.

The object of this assignment is not to have you 3D print some object. I know you can all do that. In fact, what I know is that the machine can do that. You as the designer, even as the operator, really have very little to do with it.

Instead, I want you to actually make something with this machine. I want you to explore and to discover what the machine can really do.

FDM is one of many so-called Rapid Prototyping techniques, but they all fall under one larger conceptual umbrella. They all operate by deconstructing geometry into distinct layers, then building up those layers one-by-one, depositing material on top of material discreetly to slowly build a 3D form. The process is distinctively additive, especially as compared with the subtractive processes we have and will explore with the laser and 3-axis milling and routing.

This additive process provides us a unique way to look at both geometry and fabrication. What does it mean as a process to:
1 – construct something in layers?
2 – build something up rather than subtract it away?
The Task:
Like Project 1, you will perform a series of tests on the machine and its relationship to process and form. You will then produce a single object that iterates on a found effect of the earlier tests. Because the 3D printer only works with one material – ABS plastic – we will for this exercise abstract material out of consideration and strictly position process against geometry and surface character.

First – choose three geometric conditions to work with, one each from:
- A surface relief topology (Bas relief, woodcut, image map, or terrain model)
- A 3-D shell topology (some kind of open, two-sided surface, structural or not)
- A solid 3-D object topology (an object with volume – with or without voids)

You can and should keep these fairly simple, but focused, and reasonably sized as a study. Produce a CAD model of each of these. If you have trouble, please speak with me for help.

Once you have the CAD model, process it through the Catalyst software and run the job on the 3D printer machine. It may be most efficient to build all three on the same substrate board as a single print job. We will cover how to do this in the lab.

Each of these conditions presents a very different model-to-process relationship, and if all goes as I expect, you will quickly discover differences in how each is handled and in the inherent capabilities of the machine. The construction as a series of layers will become more evident in one construction over another. Some will be more successful than others. Some models may simply not work at all. Bring them all in for discussion (failure is a great learning experience).

Second – review your results and speculate on why this singular process of construction has produced the results that you see. What kind of effects, successes, and failures are evident here?

From this review, now model and build one final object test that expands upon what you have learned to push one of the effects that you discovered to an even greater degree. If the effect is one of a smooth object becoming faceted or stepped in its layers, push that characteristic and produce a geometric condition that escalates it. If the effect is such a thin surface that the machine gives you unintended holes, perforations, or other failures, then push that characteristic and produce a model that makes this effect even more prominent. Whatever the case, learn from your initial condition and produce a new object that intentionally intensifies a single positive or negative quality that is inherent to this process of making.

Since this machine is still relatively new to the school, I’m really not sure what you will come up with, or what the machine will always do. This is an opportunity for you to really try something, and in the truest sense of the word, we will all discover something new.

What to turn in:
Bring to class for discussion:
- The results of all fabrication tests.
- A printout of the geometry file(s) used to create them.
- Your hypotheses, each in a few words or sentences.