

What's Minecraft?

A computer game. You start in an undeveloped world.



What's Minecraft?

Everything is modifiable. You can build a house...



Many Block Types



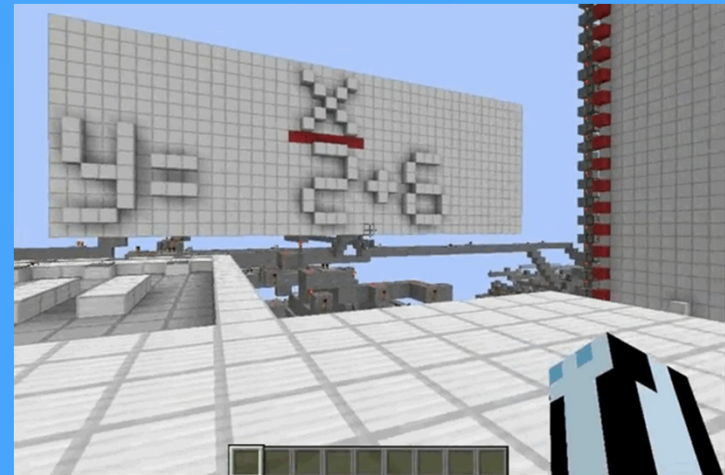
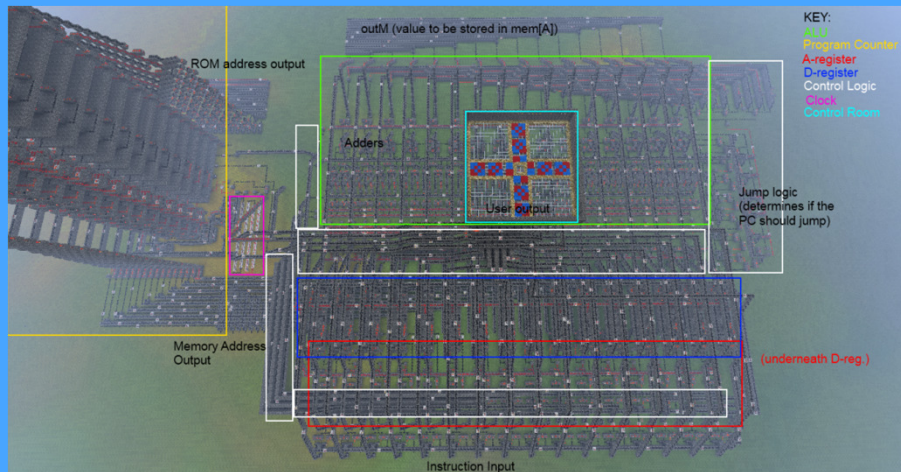
Things Built

Starships, for example



Things Built

Working computers, calculators, instruments...



Things Built

and many, many buildings



Subtractive vs. Additive Manufacturing

Subtractive:

- Carving wood or stone
- Drilling holes in a piece of metal



Additive:

- Making a sculpture by adding clay
- Building using Legos



What's Minecraft?

Is it additive or subtractive?

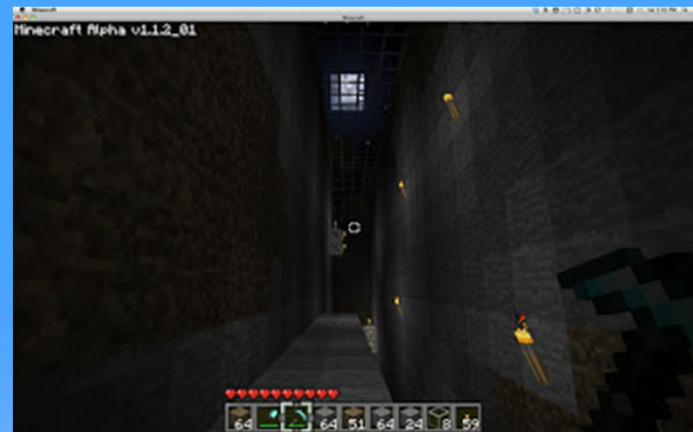


Minecraft is...

Mostly additive: you add blocks to make stuff, such as giant insects



Sometimes it's subtractive, like when you carve away a hill or make a basement.



3D Printing

Is also called “Additive Manufacturing”.

It’s like building in very tiny blocks put in a grid. You tell the machine which blocks you want filled in. Think of very tiny Lego blocks.

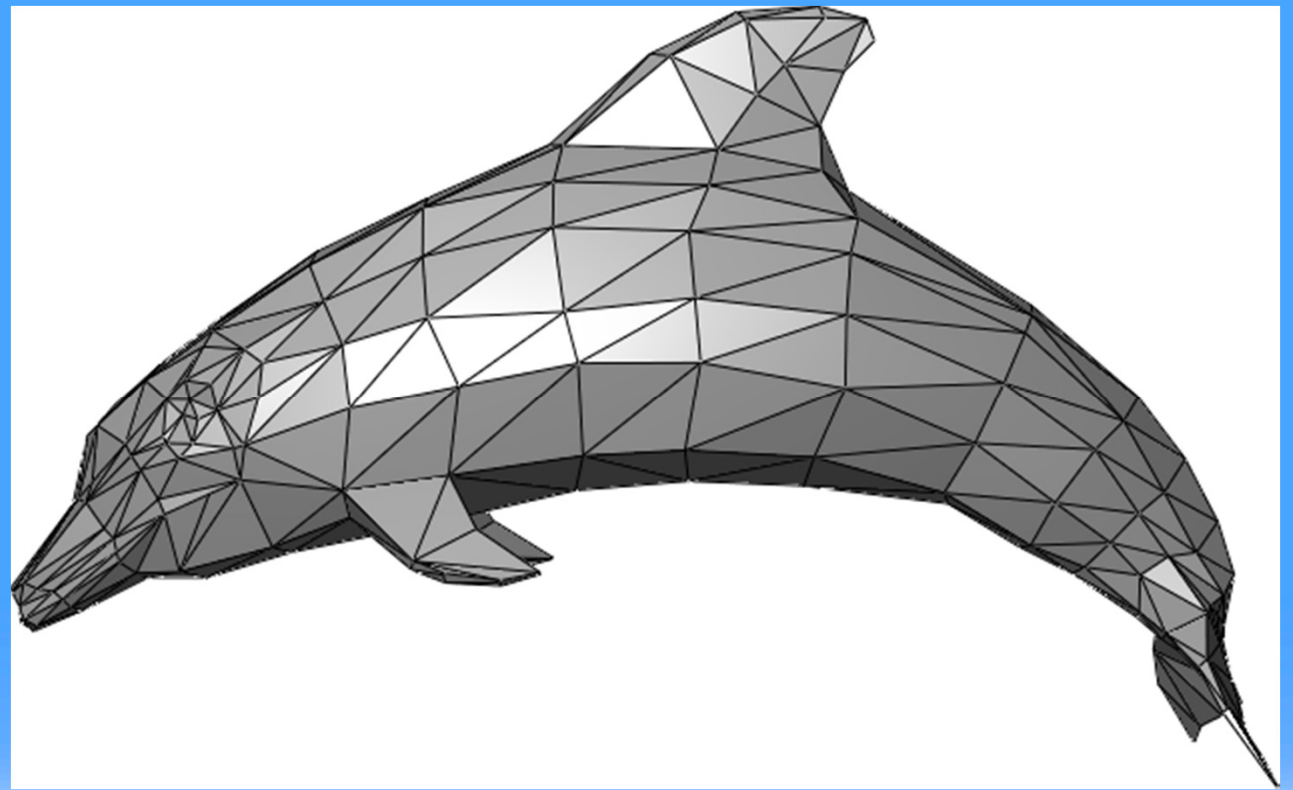
These little blocks are sometimes called “voxels” – sort of like “volume pixel”.



How to Make a Model

Describes what the surface of the model is.

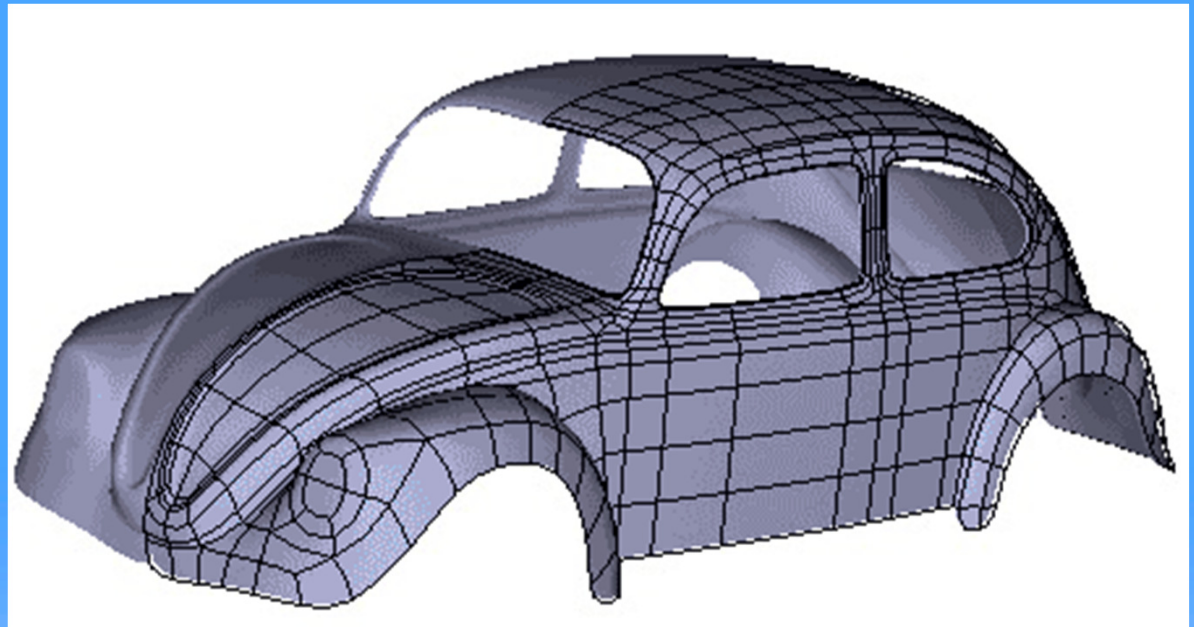
It's all just
triangles!



Watertight Surfaces

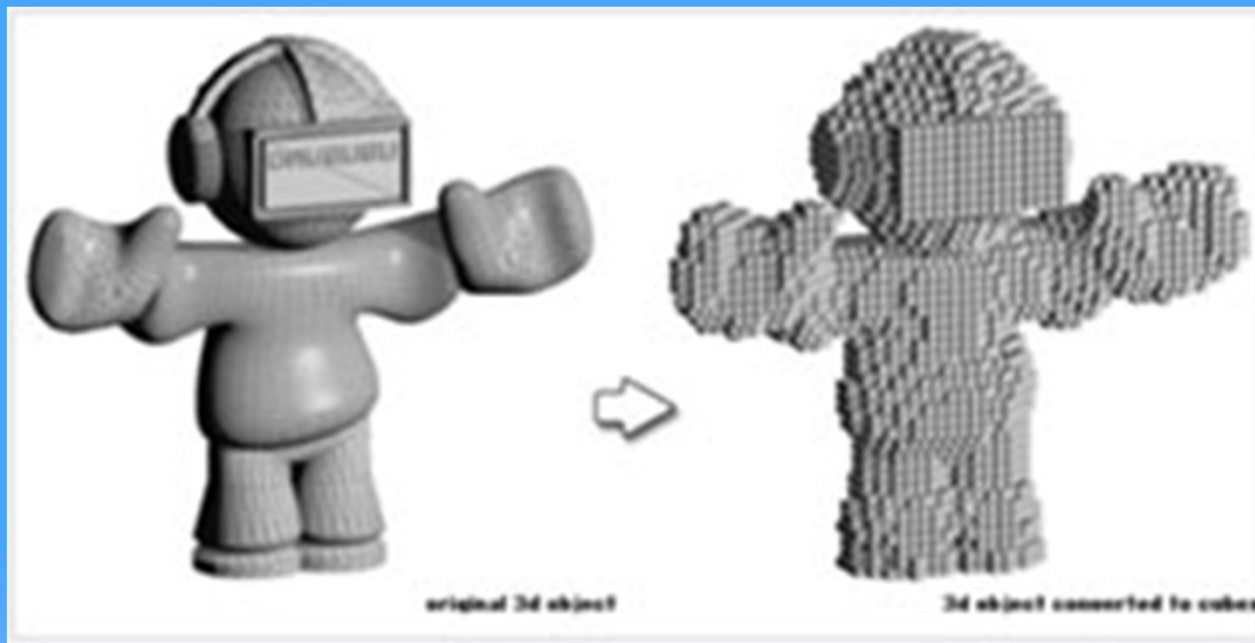
You need to make sure your triangles make a solid object.

This one isn't solid.



Conversion

The 3D printer's software converts from a surface to a bunch of voxels.



Printing a Model

This surface is then chopped into horizontal slices, like a deli meat cutter.

Each slice is then filled in by the 3D printer, layer by layer.



Materials

Plastic, metals, ceramic, sandstone, chocolate, rubber, even liver. More new ones all the time!

Would
toothpaste
work?



First 3D printing of Minecraft

Minecraft and 3D printing look like a great fit.

Minecraft.print() by two students at MIT:



Mineways

- Free program I wrote for fun.
- Select a “box” in your world to create a model.
- Takes Minecraft blocks (voxels) and figures out the triangles.
- Color 3D printers can print in full color.



Demo



Steps

Build in gravel or sand (not sandstone) in Minecraft.

Export using Mineways (we'll help!) - uncheck "Hollow parts" near bottom of options.

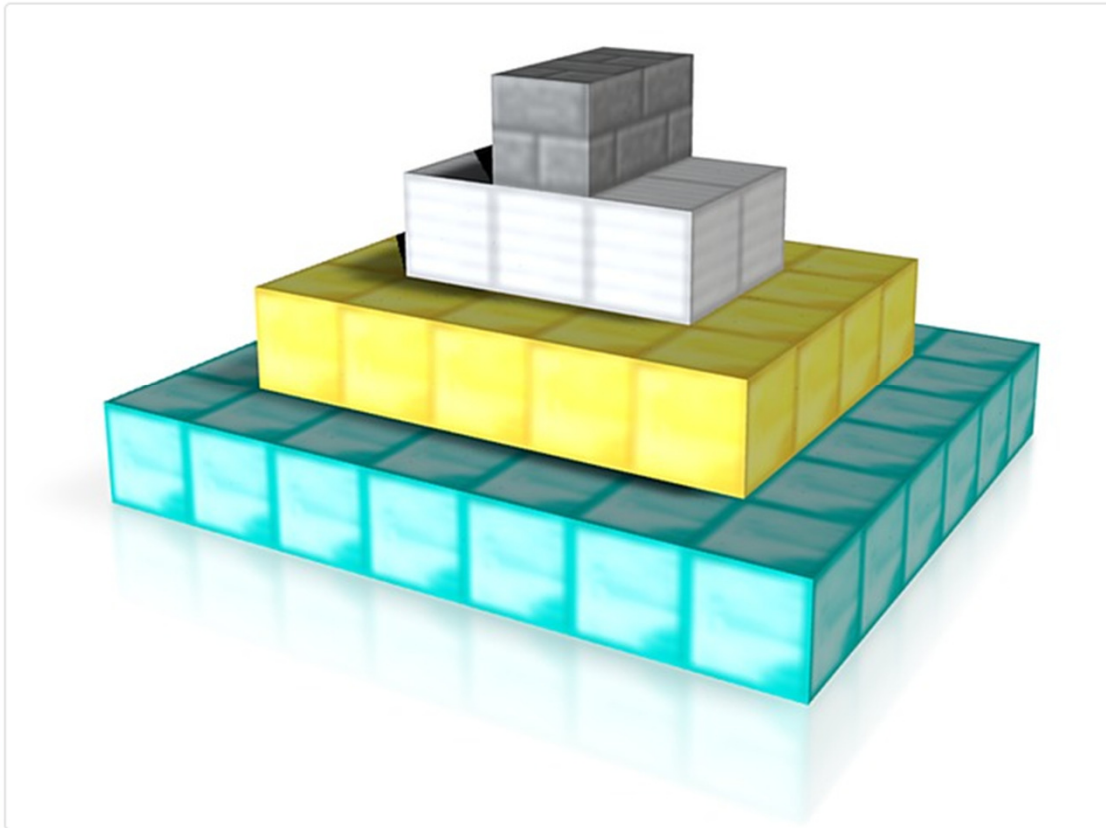
Preview with MeshLab

3D print or upload to Shapeways



Let's Do It!

Hq.wrl



Full Color Sandstone

Fully colored material with a coarse finish and a delicate feel.

\$3.42

Precious Metal



Raw Metal



Polished Steel



Matte Steel



Polished Strong & Flexible Plastic



Strong & Flexible Plastic



Detail Plastic



[BUY NOW](#)

Wall Thickness

Unlike Minecraft, if you make things in the real world, they might not work.



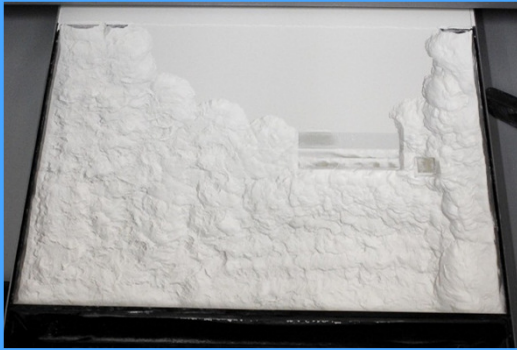
Floating Object Problem

Some obvious problems, some not so obvious

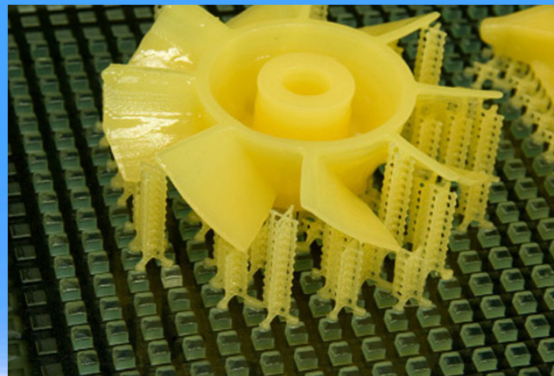


Floating Can Be Fine

Some 3D printers need no support structures:



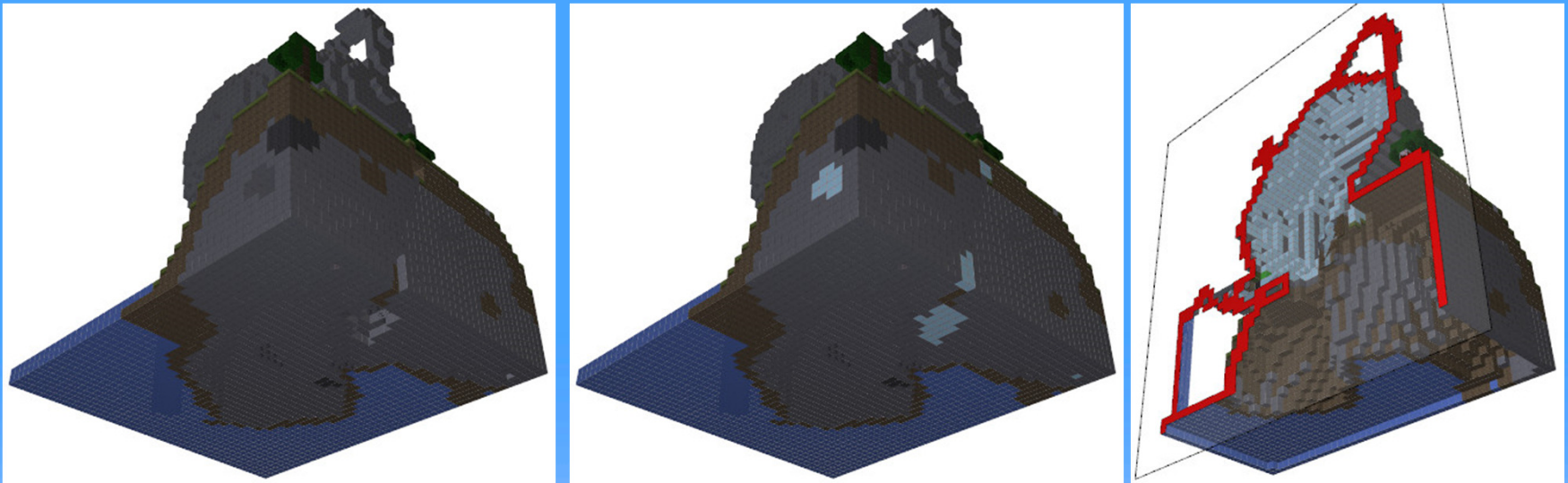
Some printers do:



Don't Print What You Can't See

Hollowing can cut costs by 3x or more.

- My trick is to fill in all interior “bubbles” found, then hollow out the single solid mass.



Big is Fun

But, larger costs more.



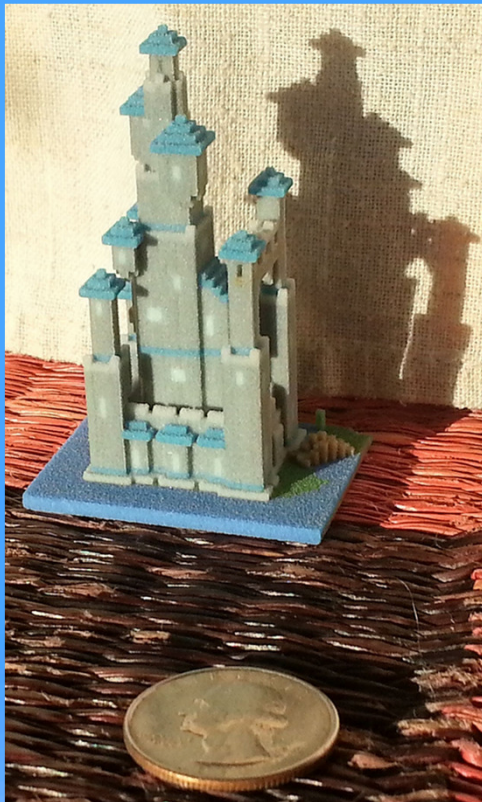
Eiffel Quiz

How many 6 inch Eiffels together weigh the same as a single 12 inch Eiffel?



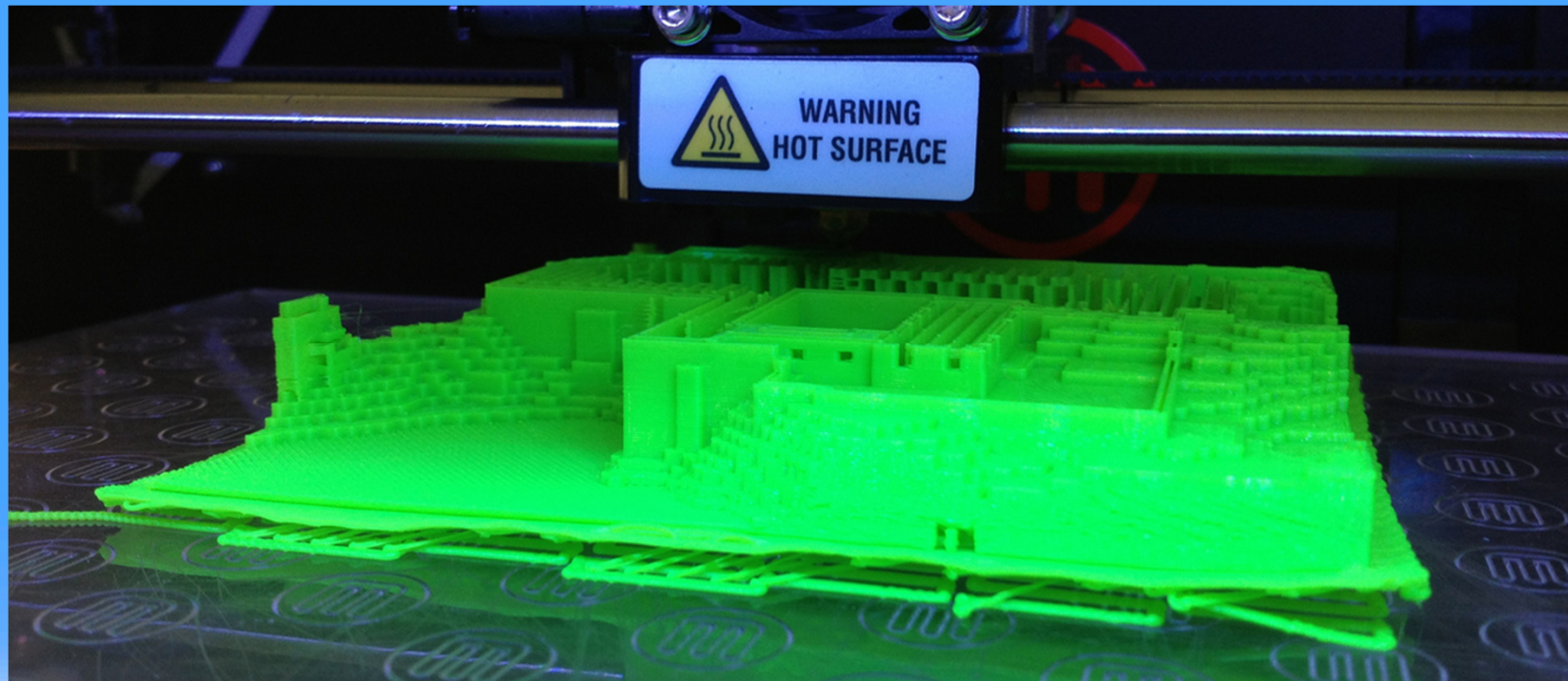
Smaller is Cuter is Cheaper is Faster

Also, complexity is free!

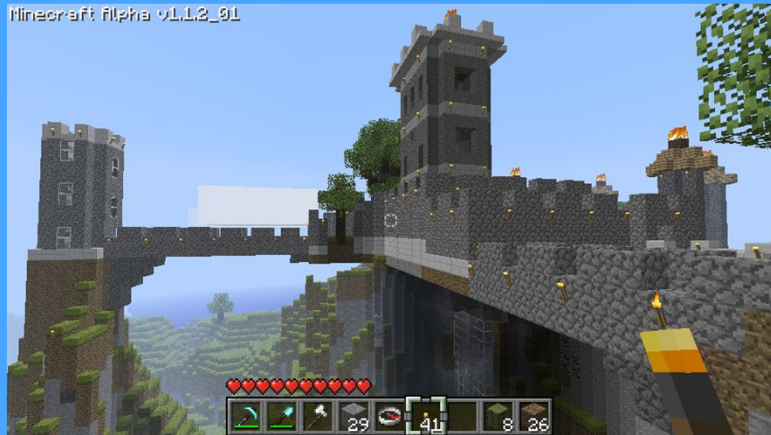


Gravel

Our 3D printer today can print only gravel (and sand) structures easily.



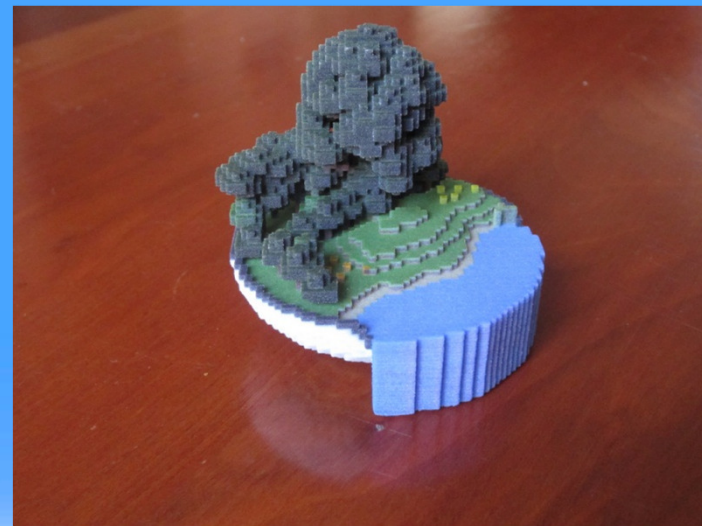
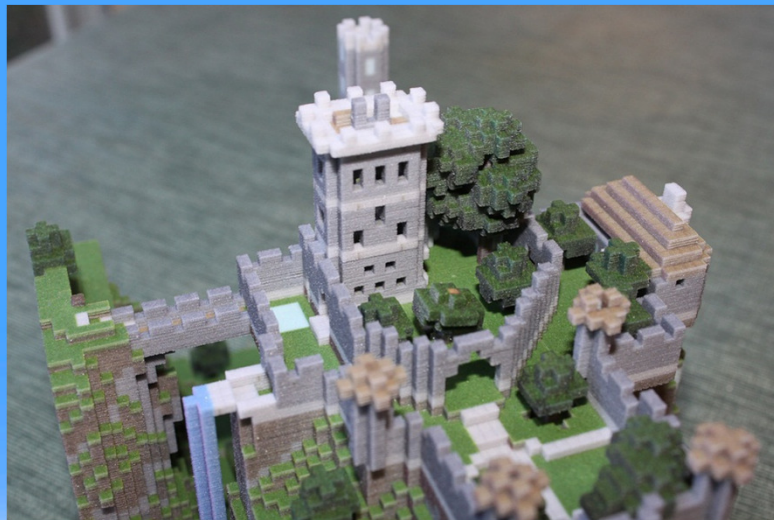
Some Examples



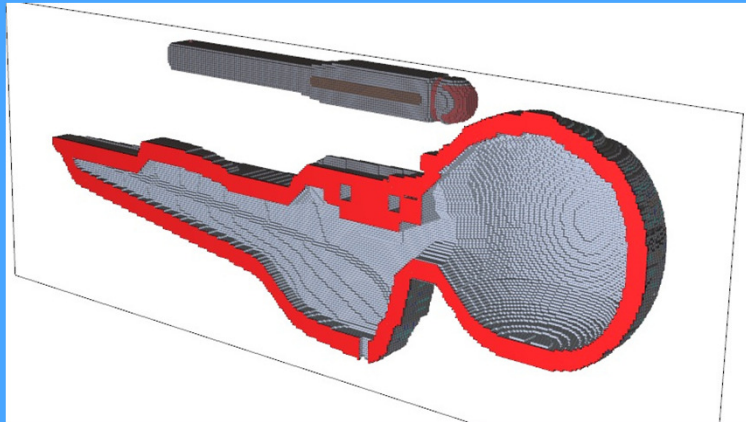
Sentinel Castle, by Mauricio Vives



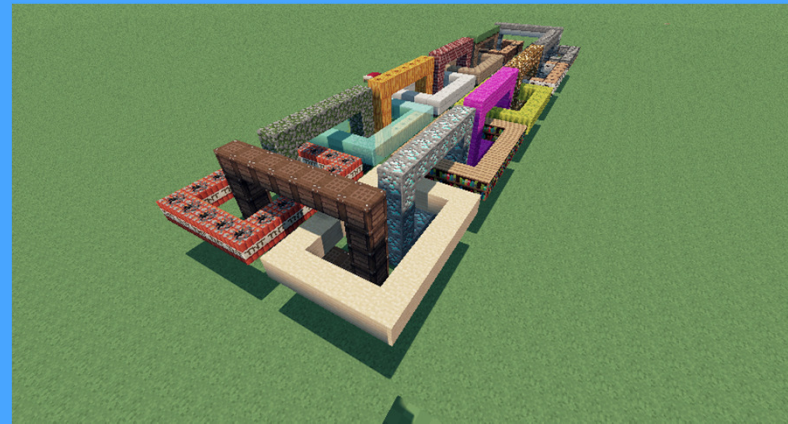
World in a Bowl, by Nefashu



Still More Examples



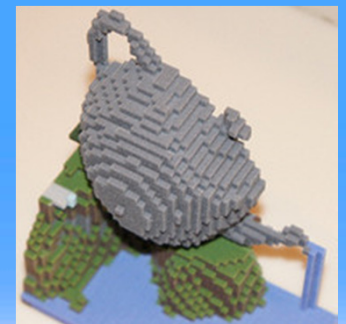
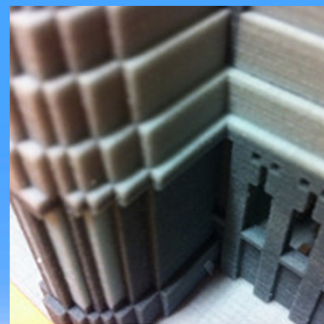
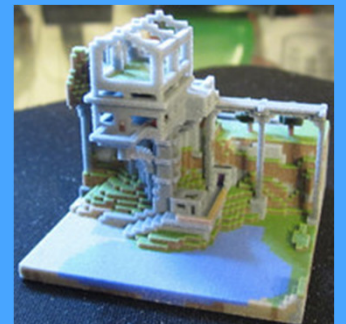
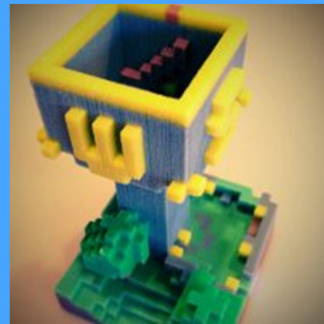
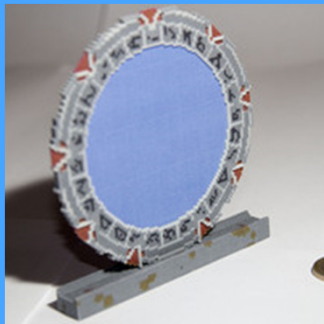
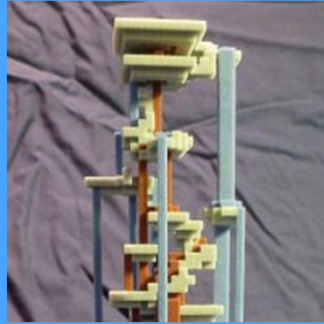
Olympic starship, by Momentaneously



Chainlandia, by combineelite



And More



And You Can Make Pictures



Image made with Arnold, by Estopero. Appears on the cover of "3D Artist" magazine.

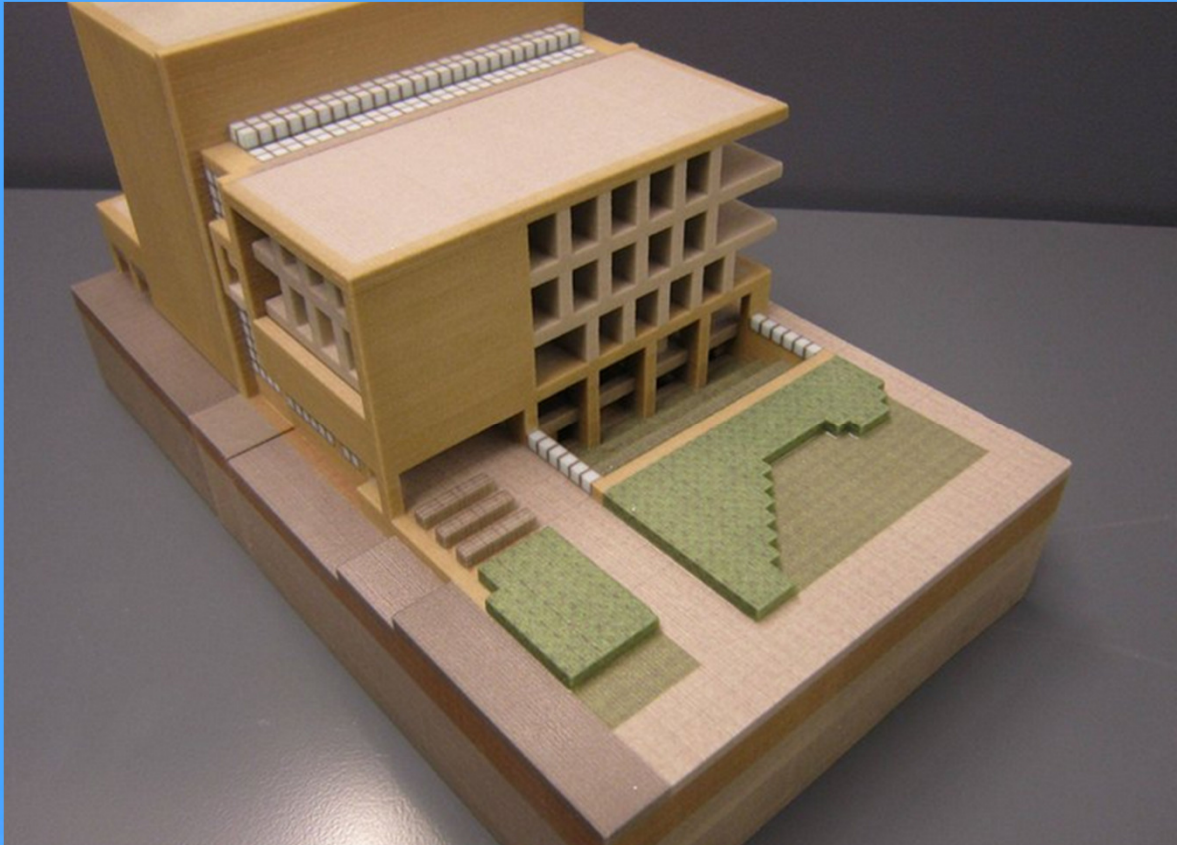
A Practical Use



Northwestern University Campus, by Ben Rothman



A Practical Use



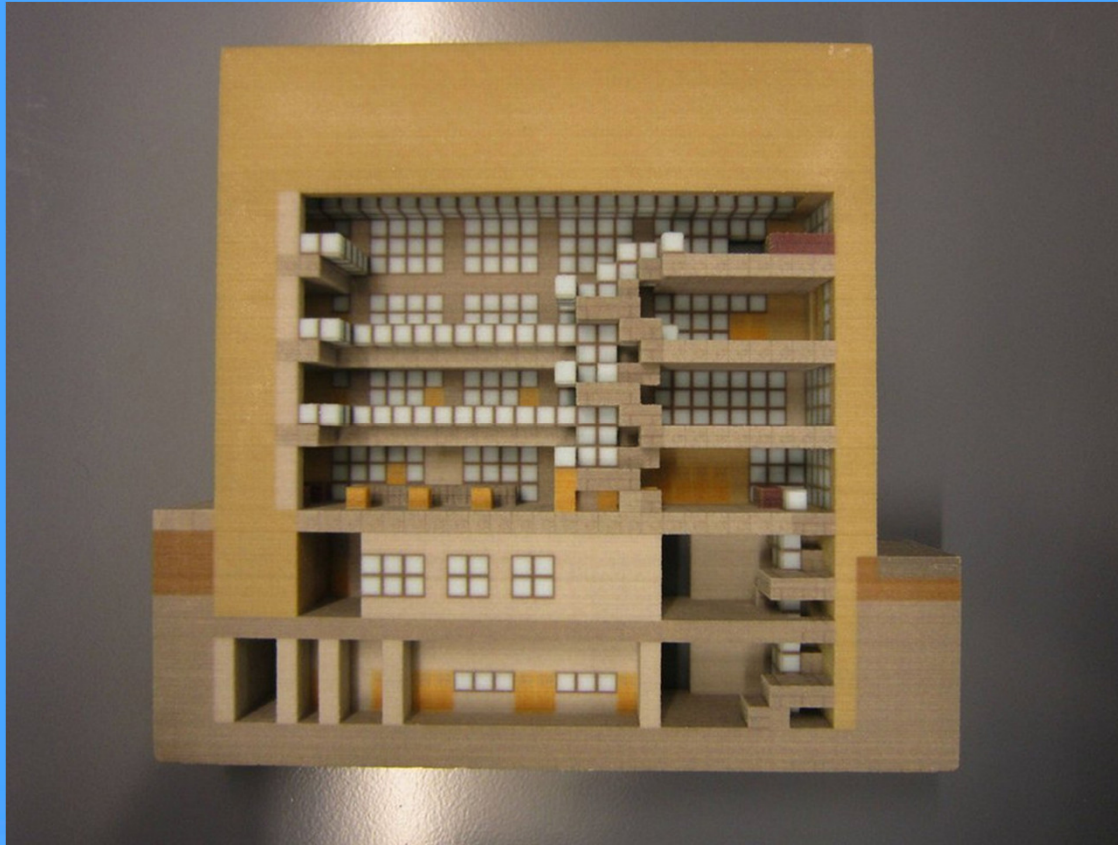
Ford Engineering Design Center, by Ben Rothman

A Practical Use



Ford Engineering Design Center, by Ben Rothman

A Practical Use



Ford Engineering Design Center, by Ben Rothman

Or, the Whole Campus...



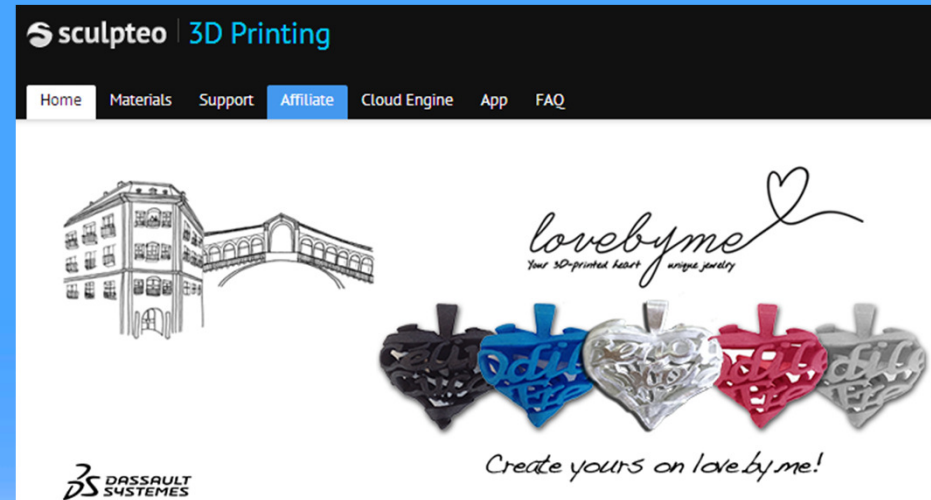
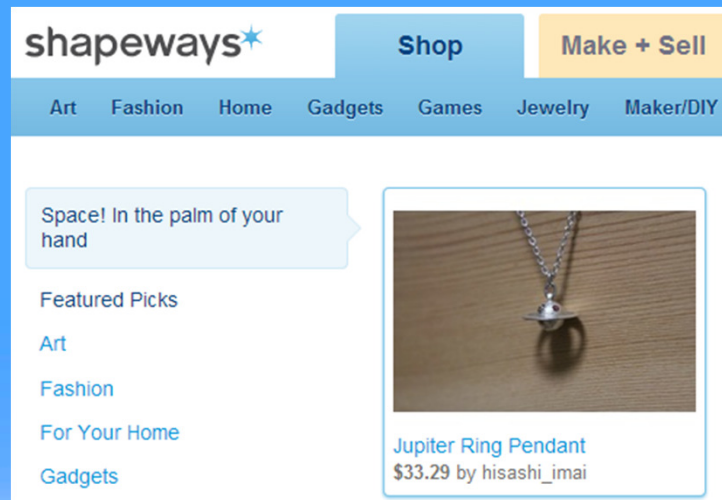
Northwestern University, by Ben Rothman



No Printer?

I don't have one, either. I use two print service firms:

- Shapeways: cheapest, and slowest
- Sculpteo: more expensive, faster



Pro Tips for Mineways

- The “[” and “]” keys adjust the selected bottom level up and down.
- Middle-mouse can also select height.
- Control-X: eXport again with same options.
- Import Settings lets you load a previous exported file for its settings.
- Color Schemes let you remove various types of blocks.



Go Have Fun!



Notes



These slides download from <http://bit.ly/mineparts>

Mineways is at <http://mineways.com>

Minecraft is at <http://minecraft.net>

Shapeways is at <http://shapeways.com>

Sculpteo is at <http://sculpteo.com>

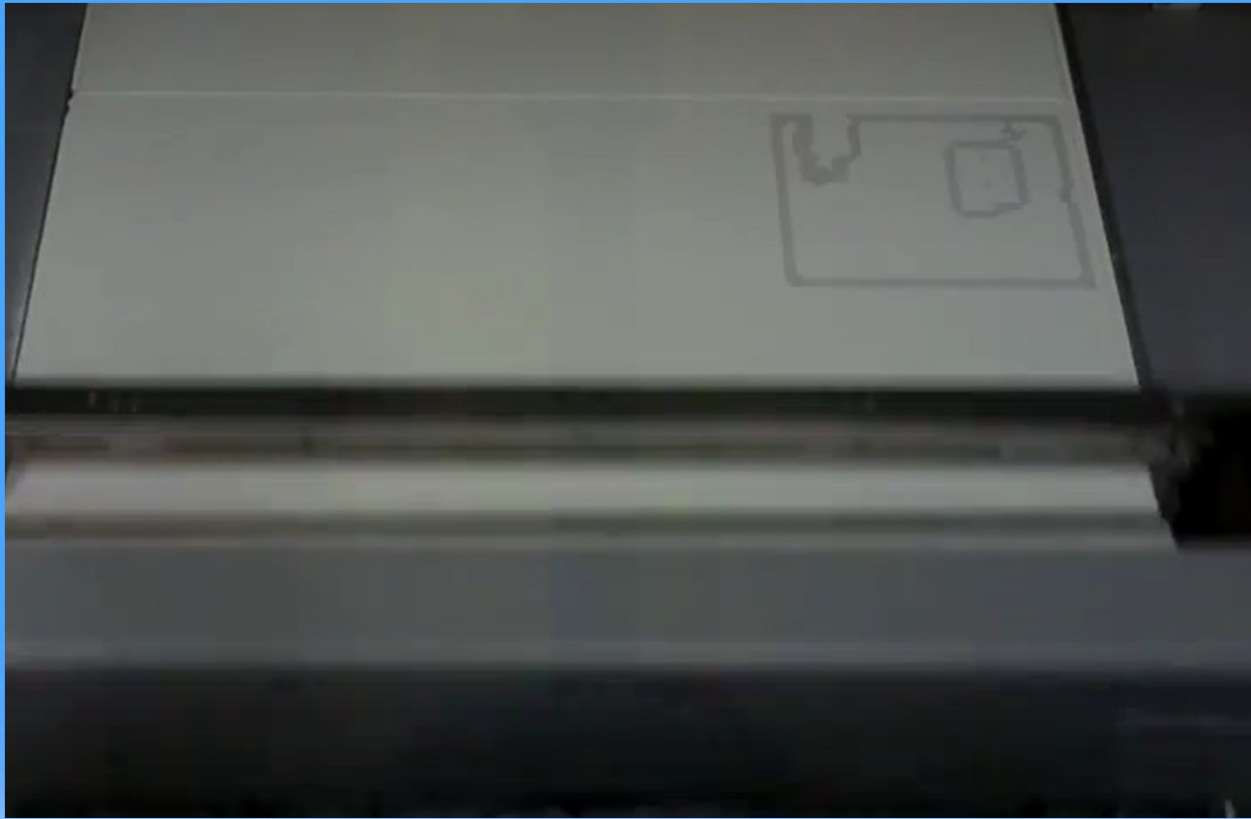
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Leftovers...



Additive Manufacturing

Here's one type of printer, it lays down layers:



Then Subtractive

Then you dig your model out:



More Subtraction

Then vacuum it:



A Bit More

Then clean with pressurized air:



The Last Step

Then douse with superglue.

