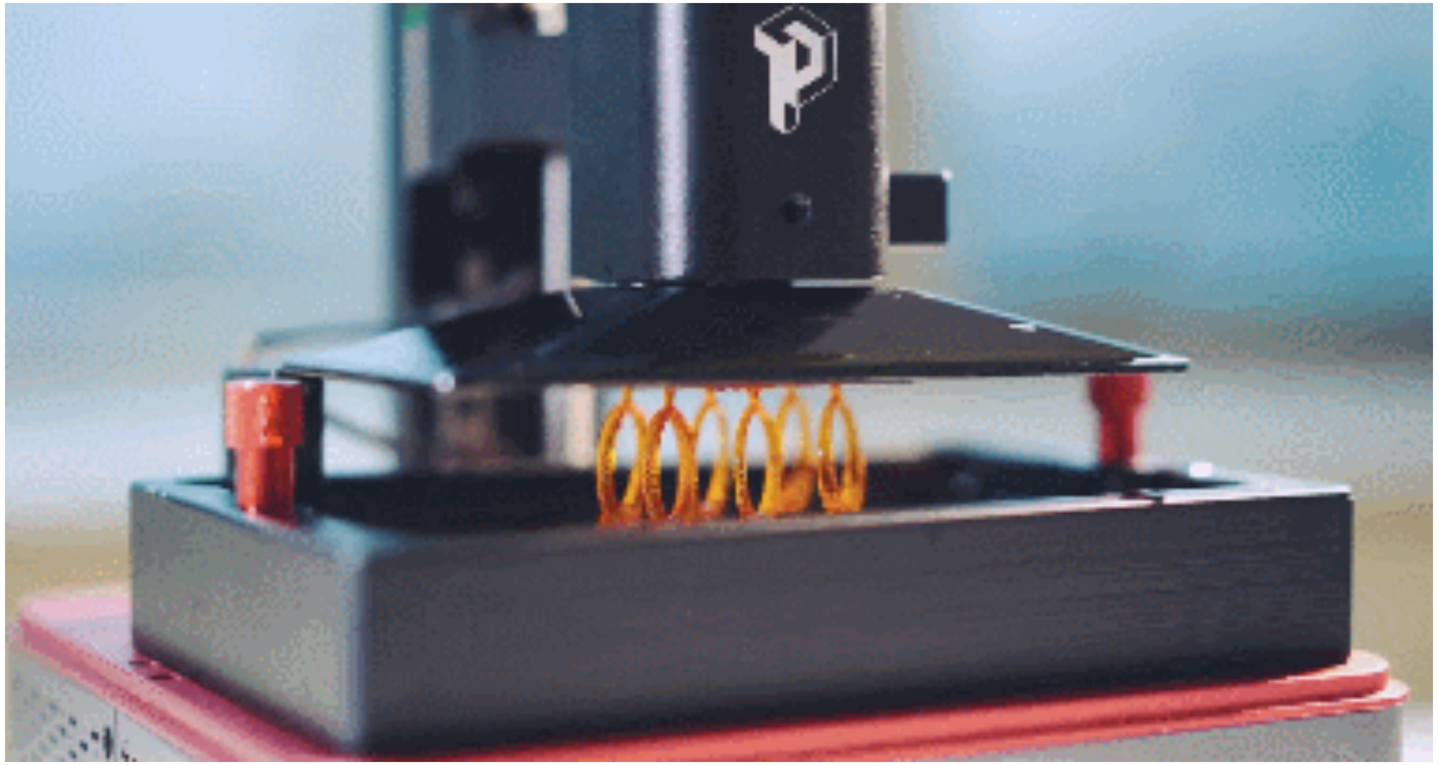
Computational Fabrication



Announcements

Assignment 8 due Sunday 9 August

Office hours today after lecture

Tutorial on Friday for questions on A8

Bonus assignment due Sunday 16 August

Final exam Saturday 22 August at 9pm (according to vote)

Bonus Assignment

Goal: make the coolest image or video using the tools we learned in the course

Turn in:

- the image or video in a zip file
- README describing
  - why you decided to make what you did
  - your process
  - what you tried (what worked and did not work)

Will be scored 0-5. Add this number to your final mark. e.g. you have a 78% in the course and get 3 points on the bonus assignment. Your mark is now 81%.

Computational Fabrication

Today:

General Overview

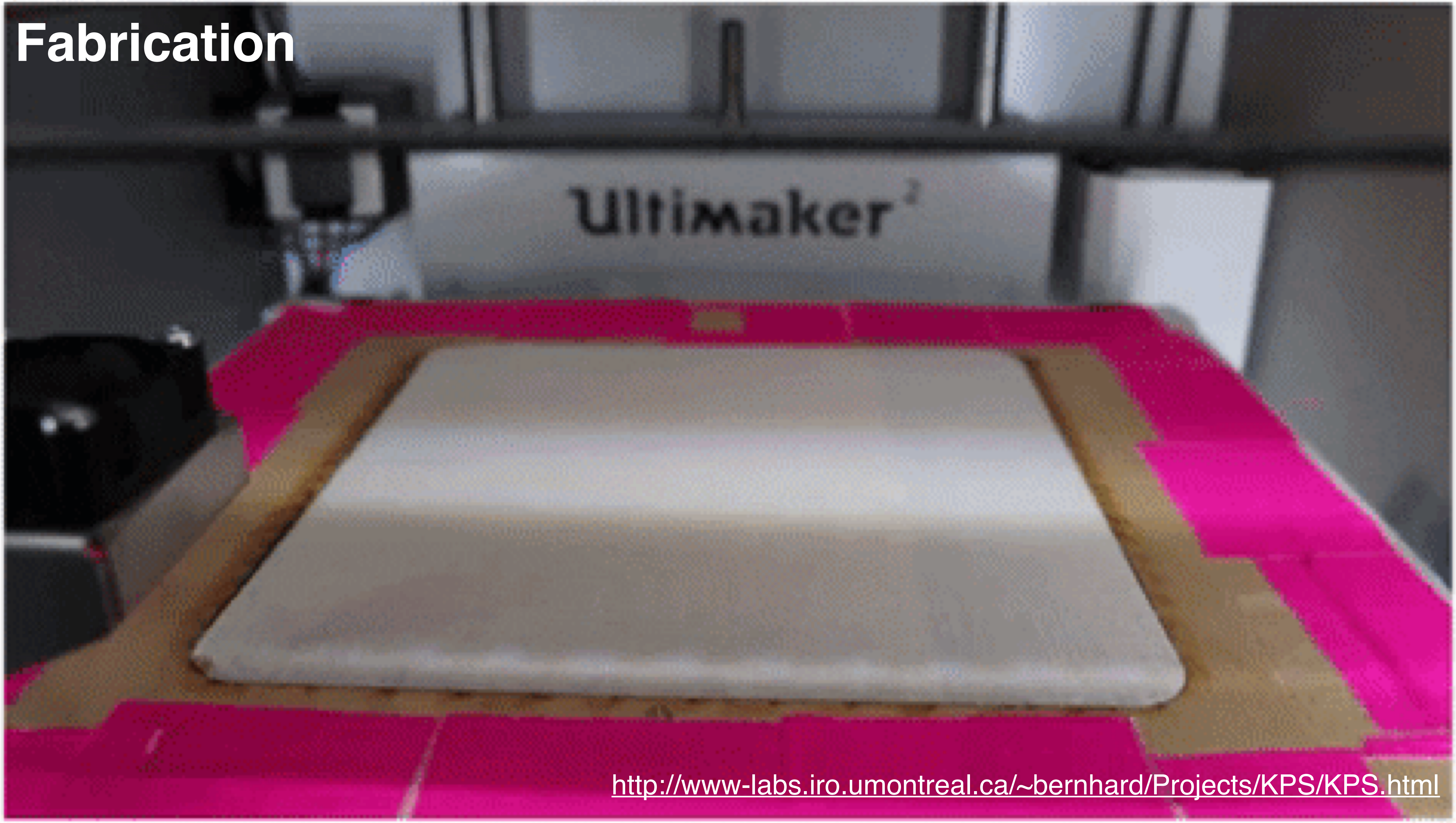
Subtractive Manufacturing

Additive Manufacturing

Challenges

My favorite papers

Fabrication



http://www-labs.iro.umontreal.ca/~bernhard/Projects/KPS/KPS.html

Any Questions?

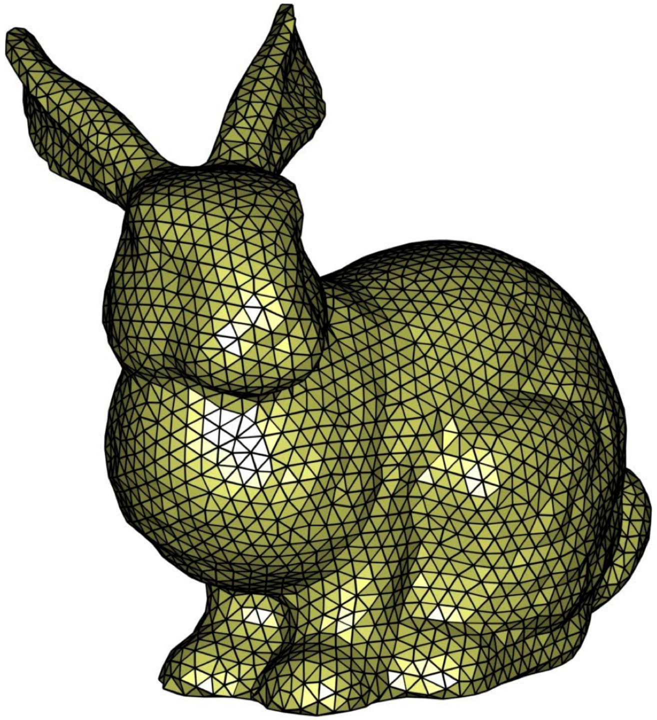
What is computational fabrication?

Telling a machine

What is computational fabrication?

Telling a machine

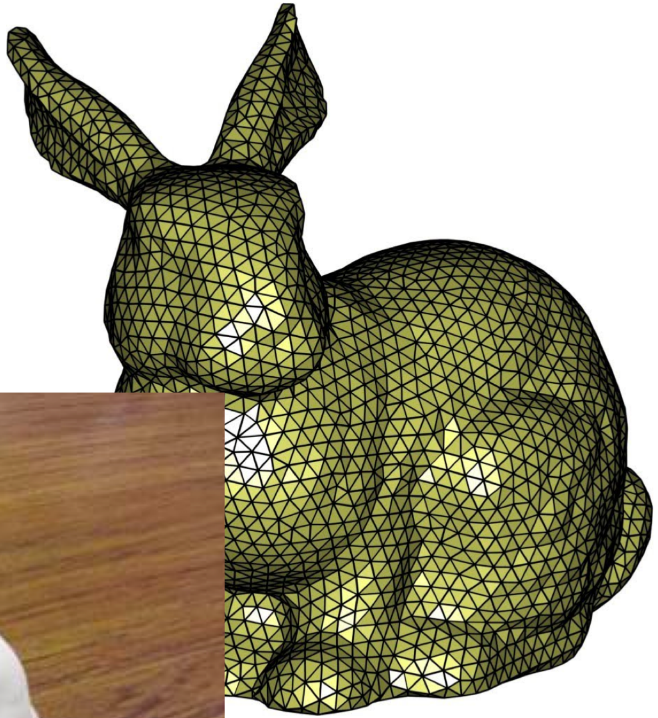
to transform digital information



What is computational fabrication?

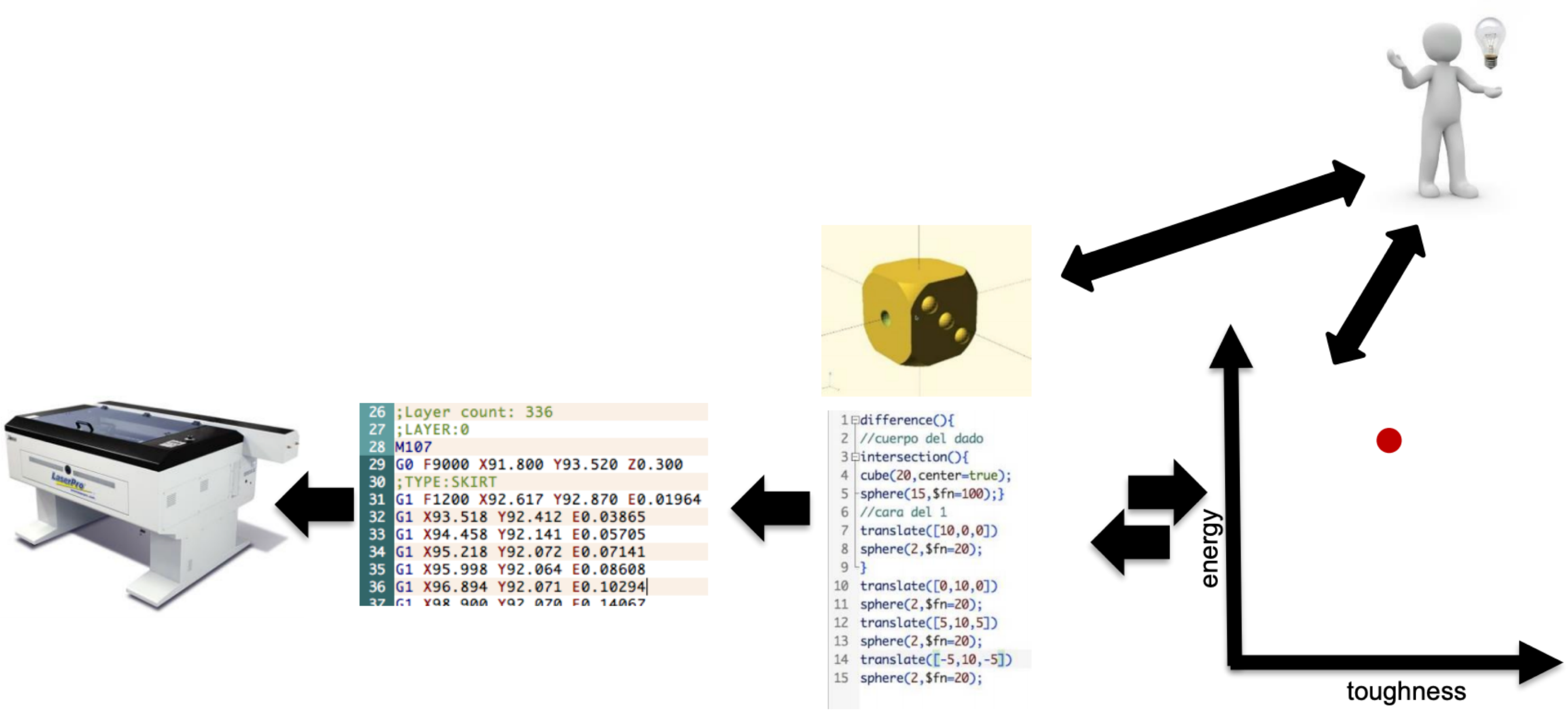
Telling a machine

to transform digital information



into physical products!

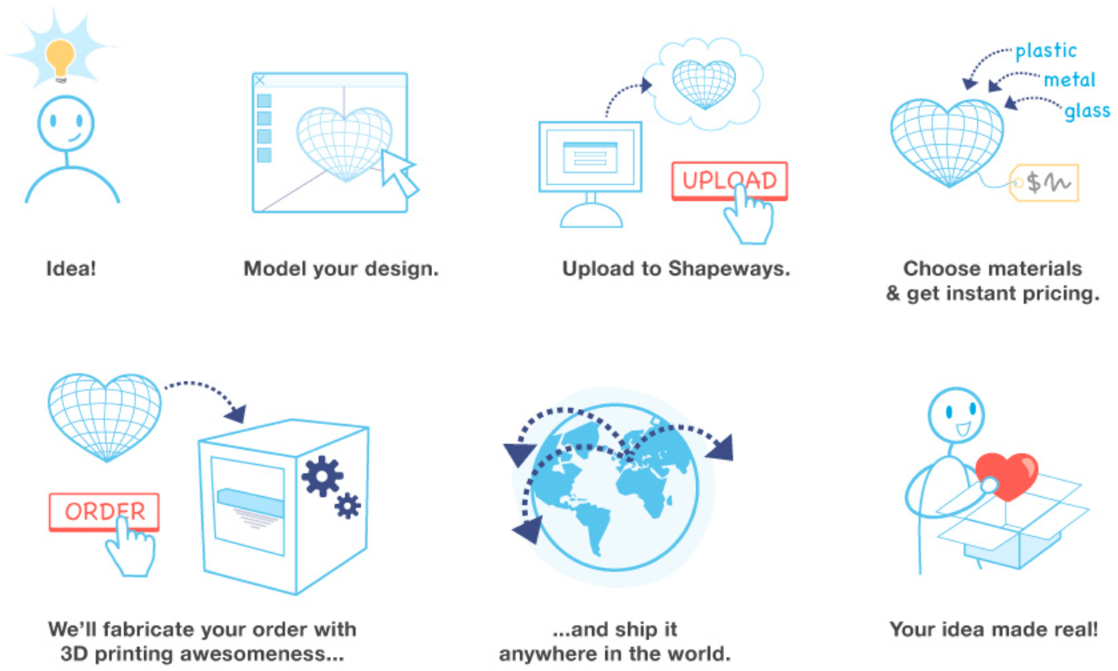
Process



Hardware **Machine Code** **Design** **Performance**

https://homes.cs.washington.edu/~adriana/CompFab/course_Part1.pdf

Process

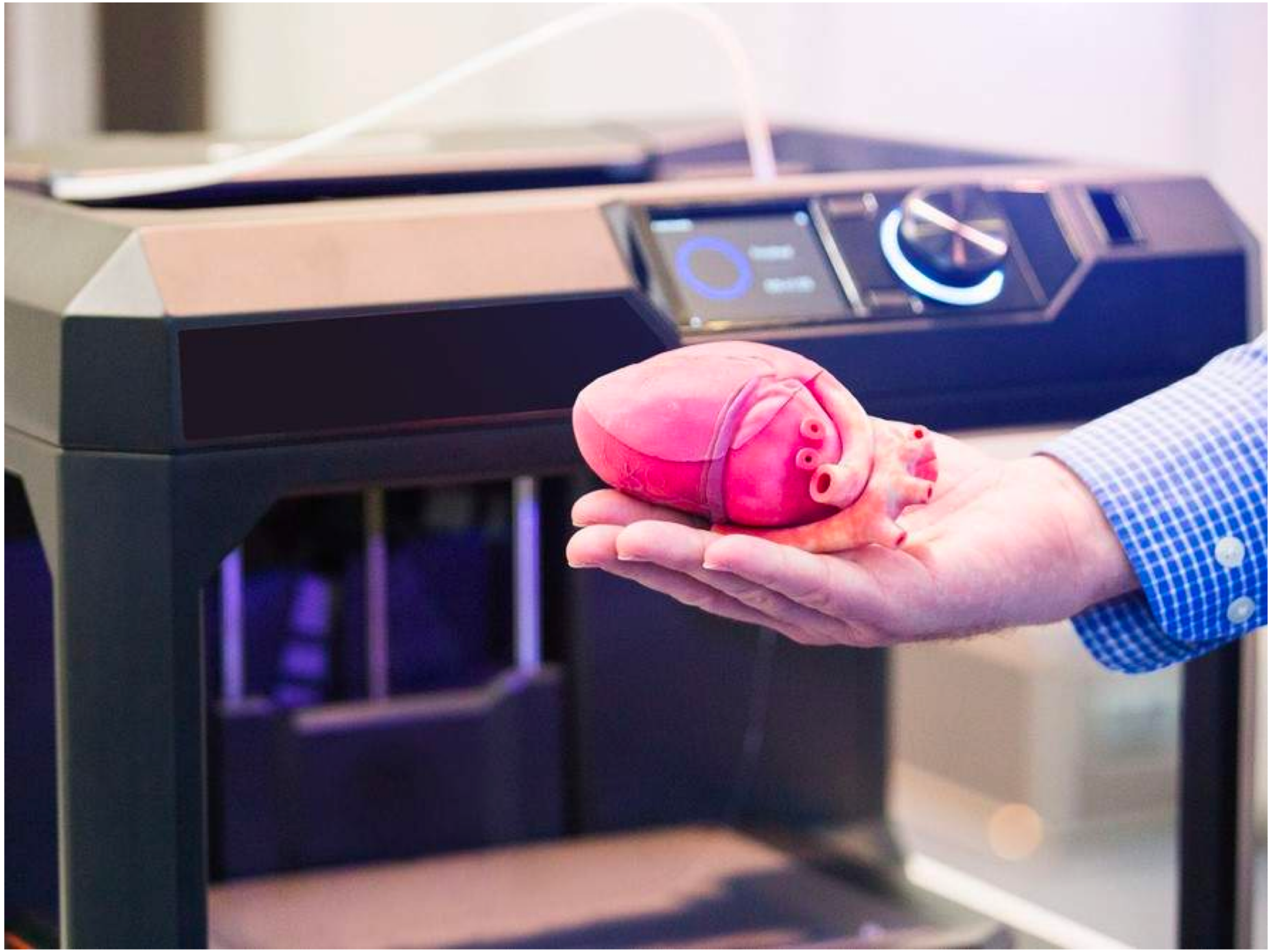


http://3dbizcenter.com/how-does-3d-printing-work/

Applications

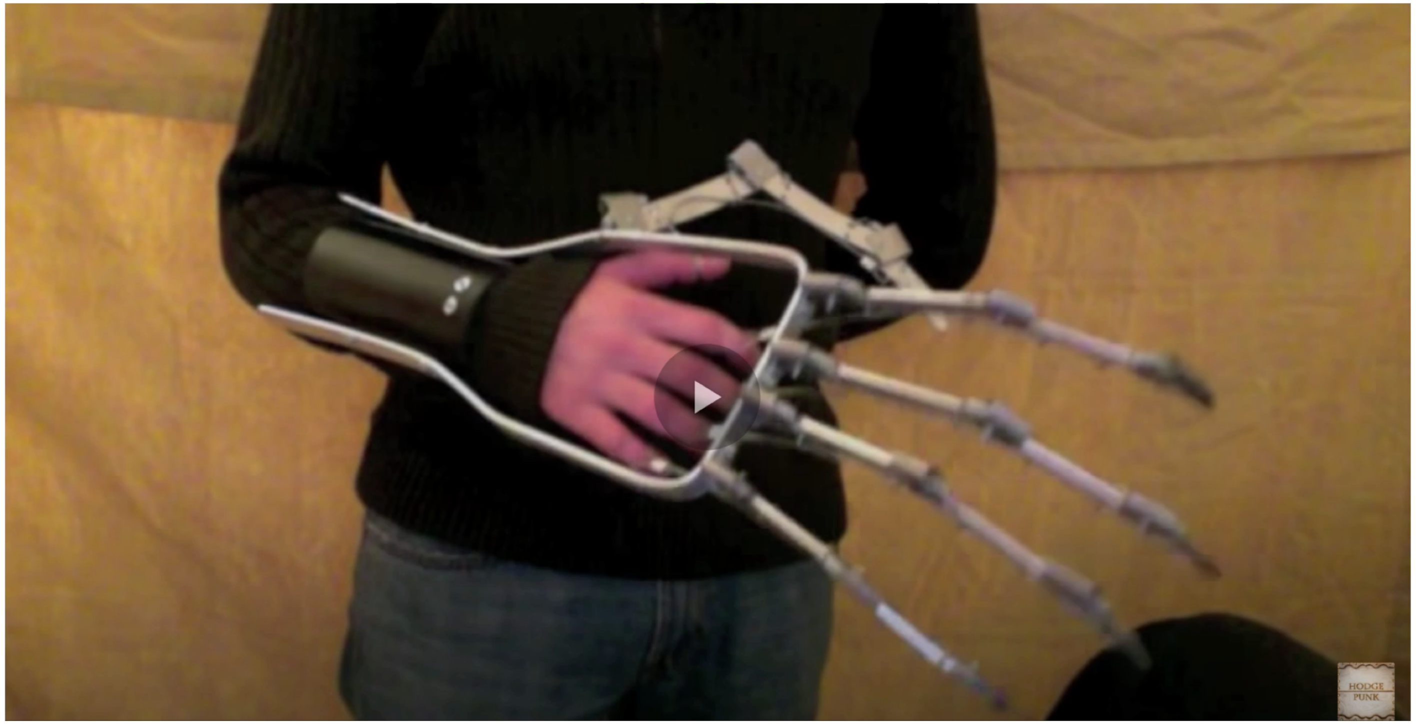
https://www.youtube.com/watch?v=qlomslovAnI

Applications



https://www.medicaldevice-network.com/features/3d-printing-in-the-medical-field-applications/

Applications



https://www.amputee-coalition.org/3d-printed-prosthetics/

Applications

https://n-e-r-v-o-u-s.com/projects/albums/dress-in-motion/content/jump-composite/

Applications

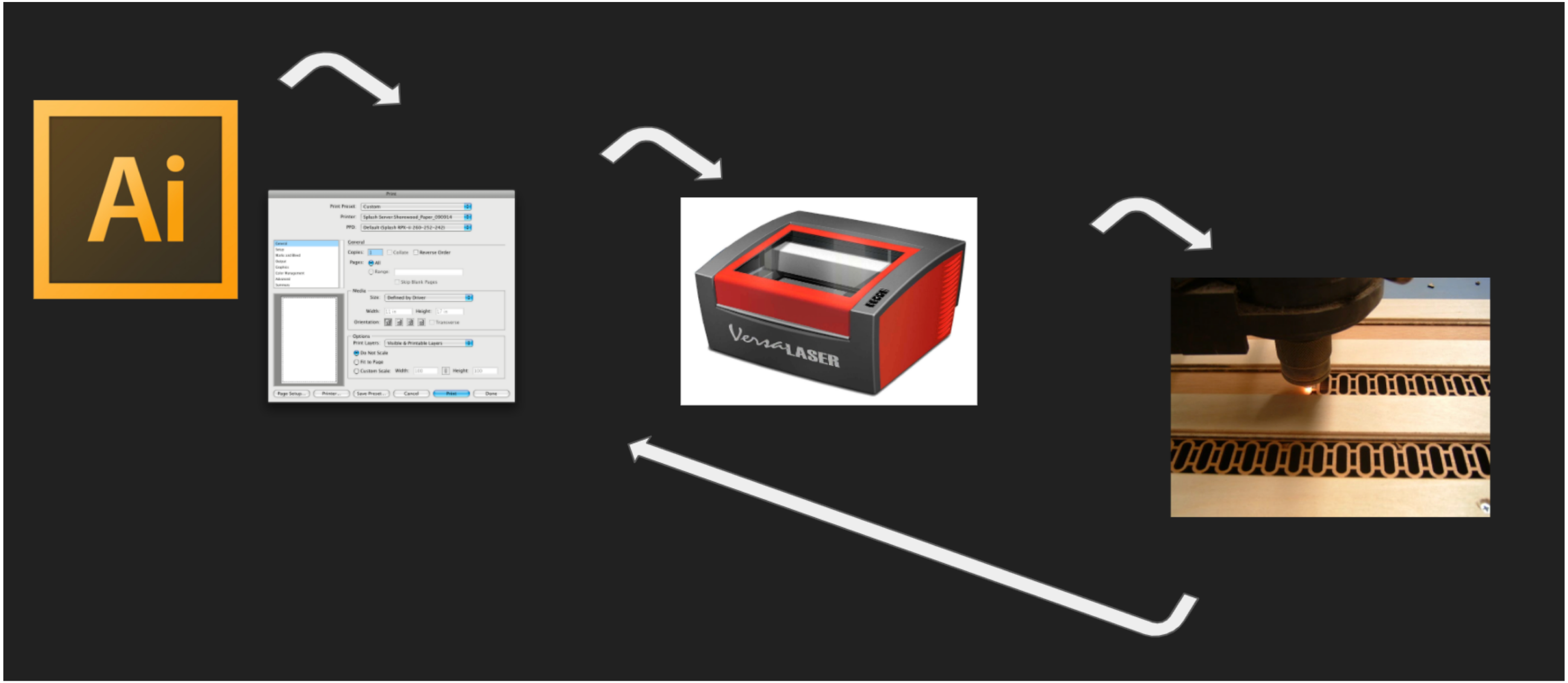
Applications

Subtractive Manufacturing

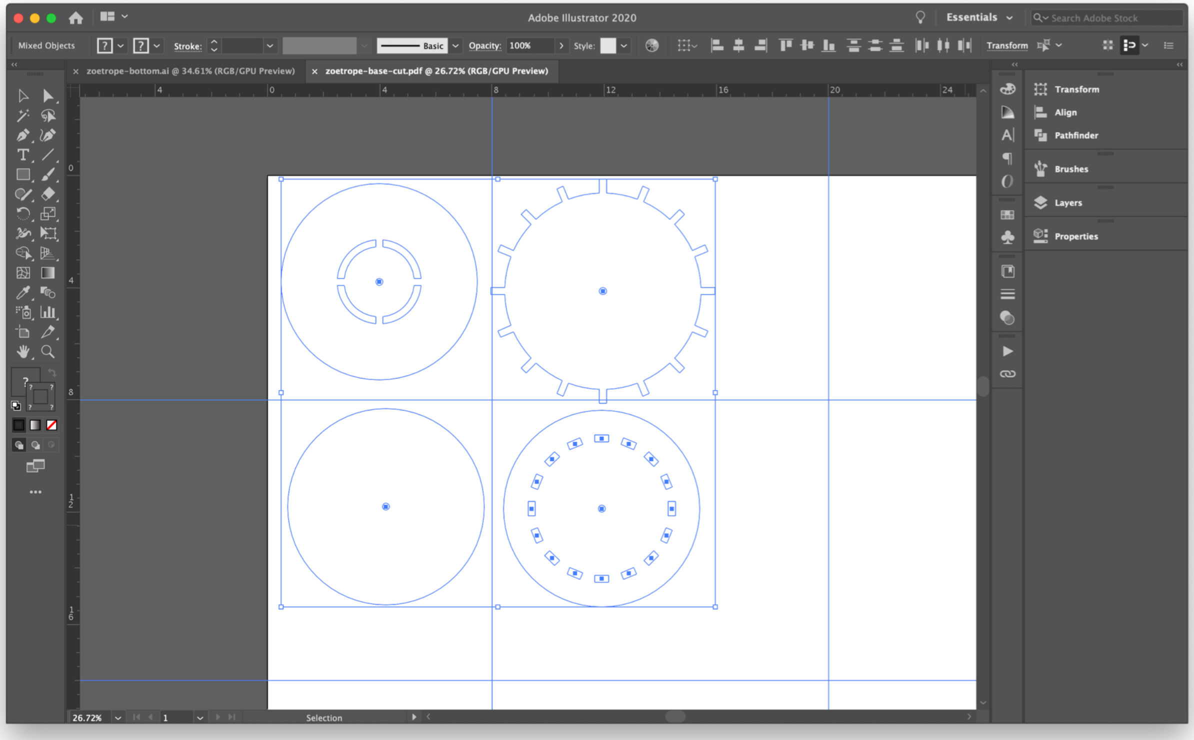
Starting with material

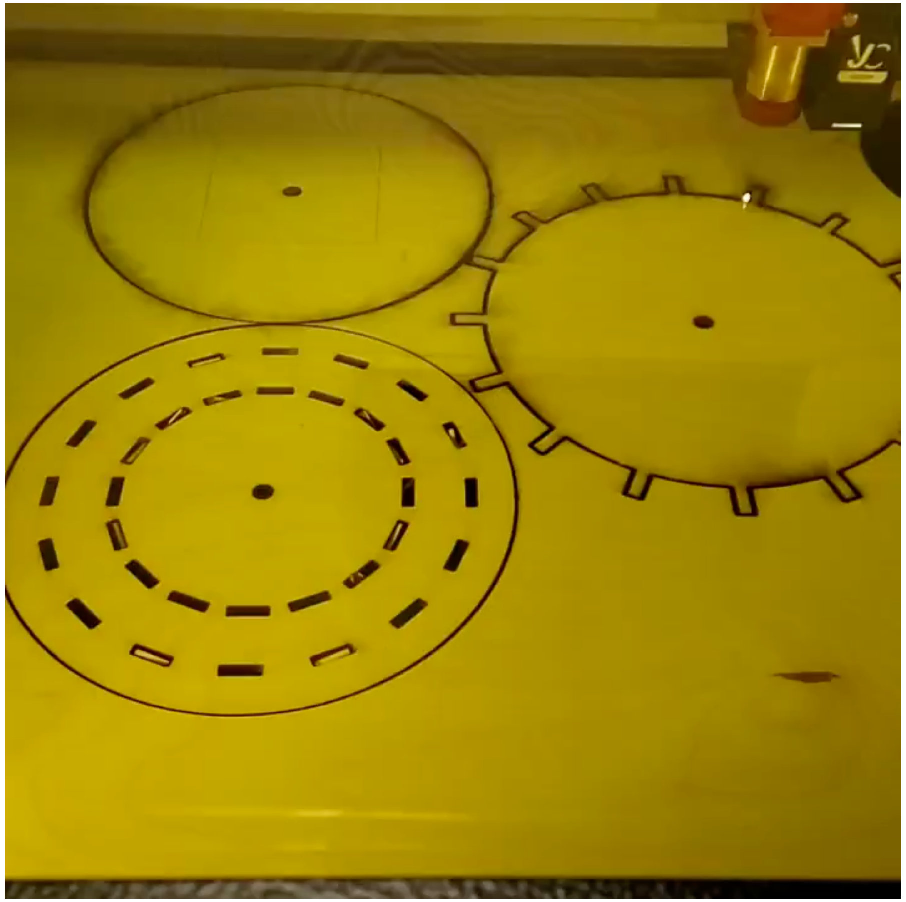
Then taking some away

Subtractive Manufacturing

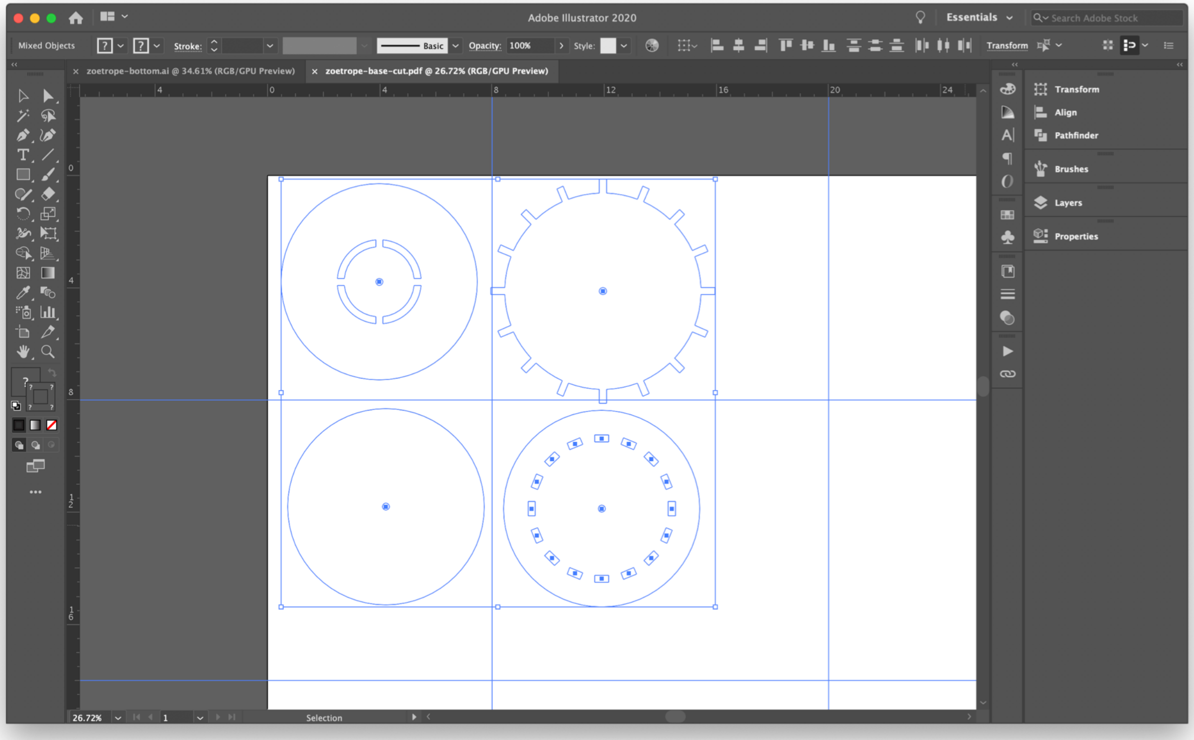


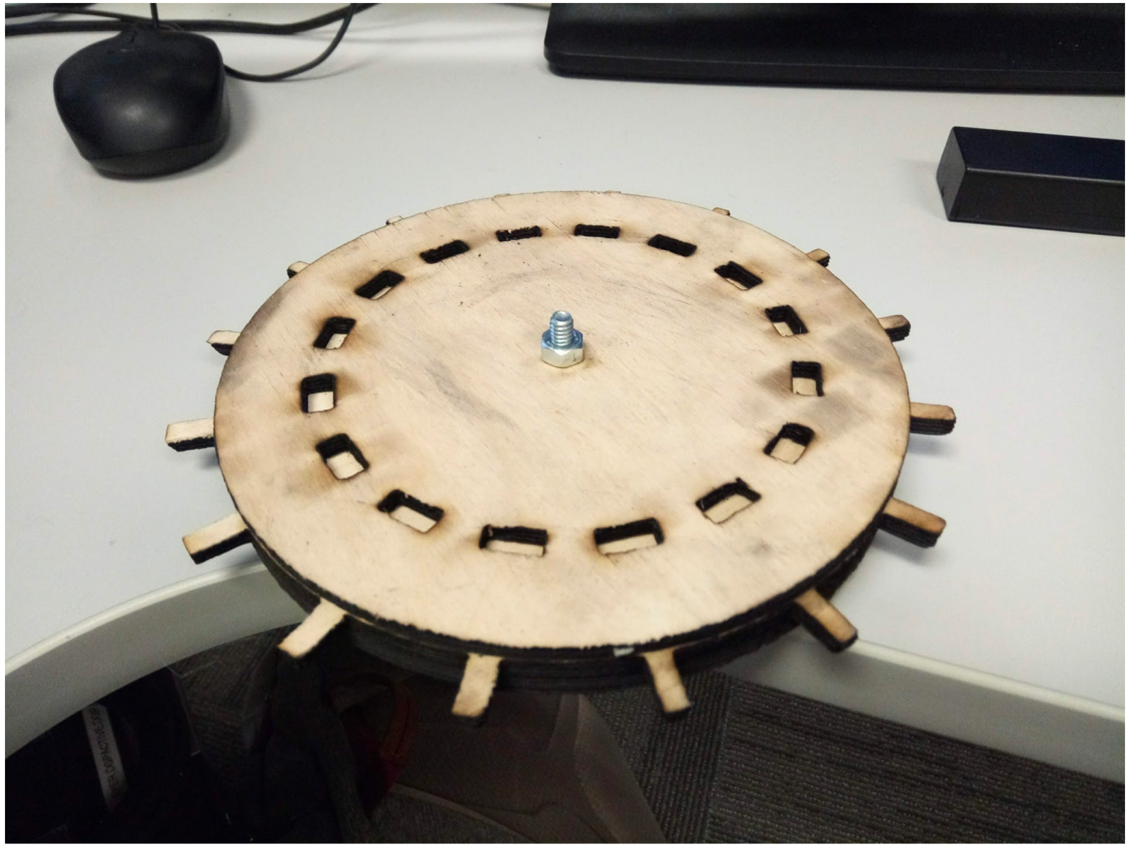
Subtractive Manufacturing



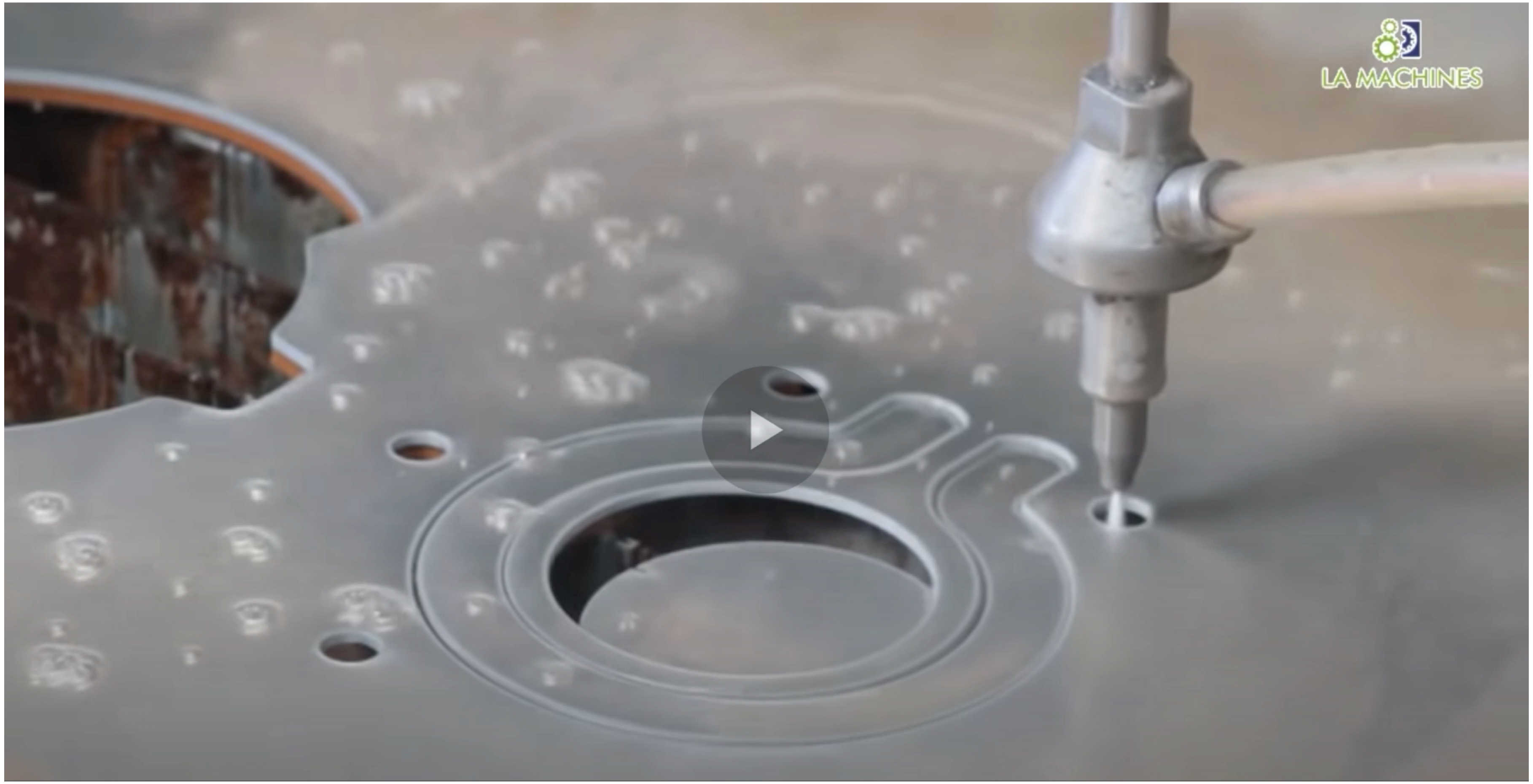


Subtractive Manufacturing





Subtractive Manufacturing

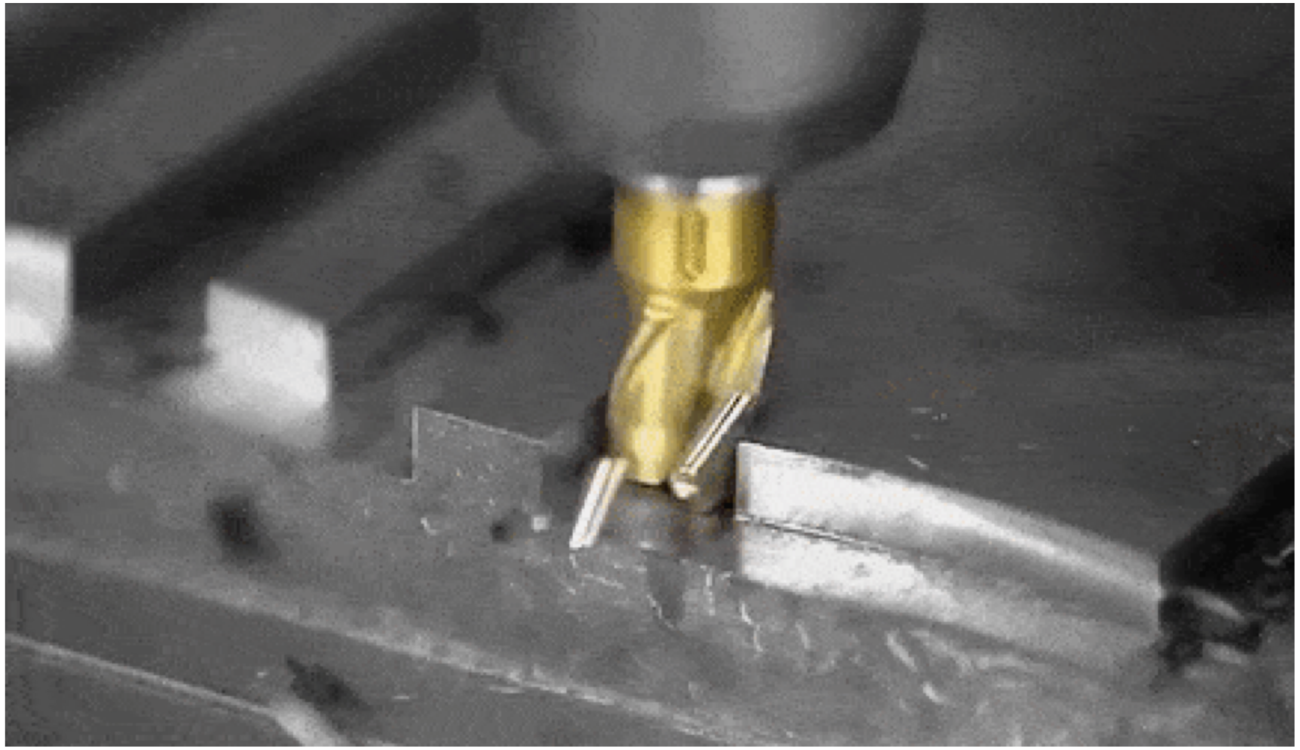


https://www.youtube.com/watch?v=sIEqXbXxpfg

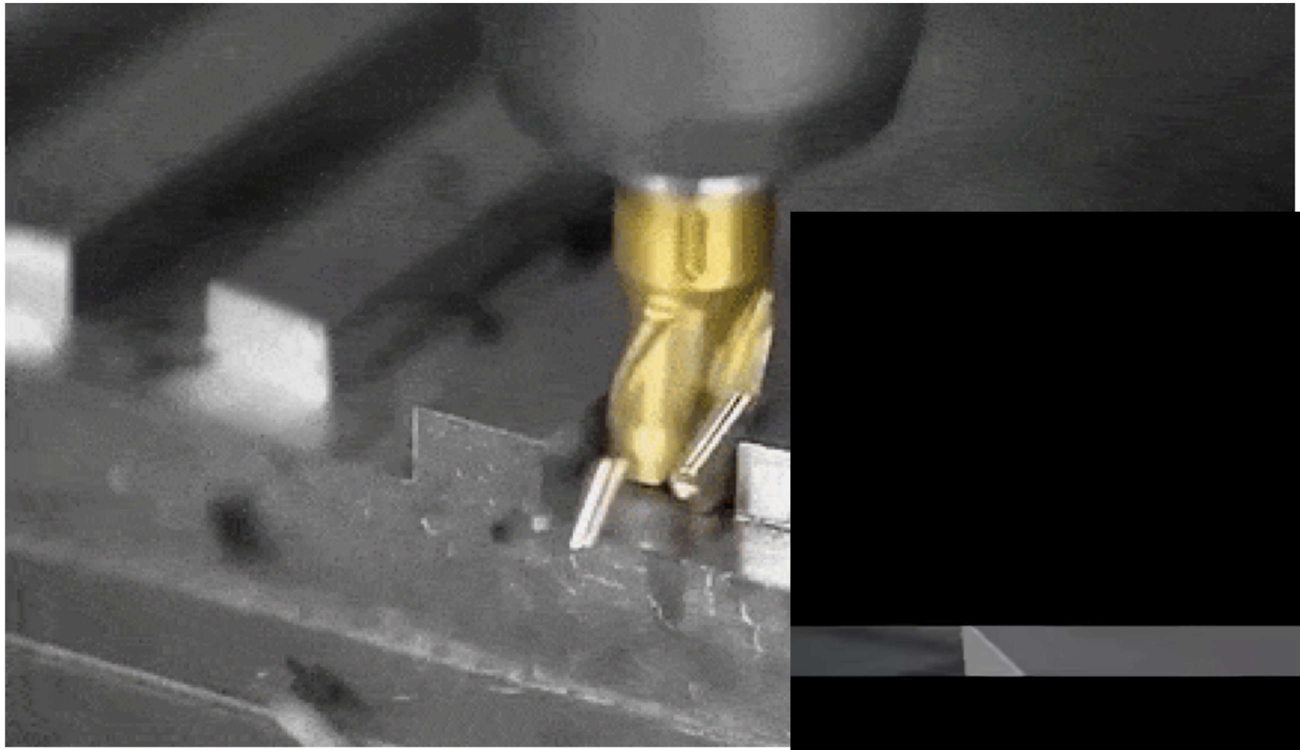
Subtractive Manufacturing

https://www.sculpteo.com/en/3d-learning-hub/laser-cutting/laser-cutting-vs-water-jet-cutting/

Subtractive Manufacturing



Subtractive Manufacturing



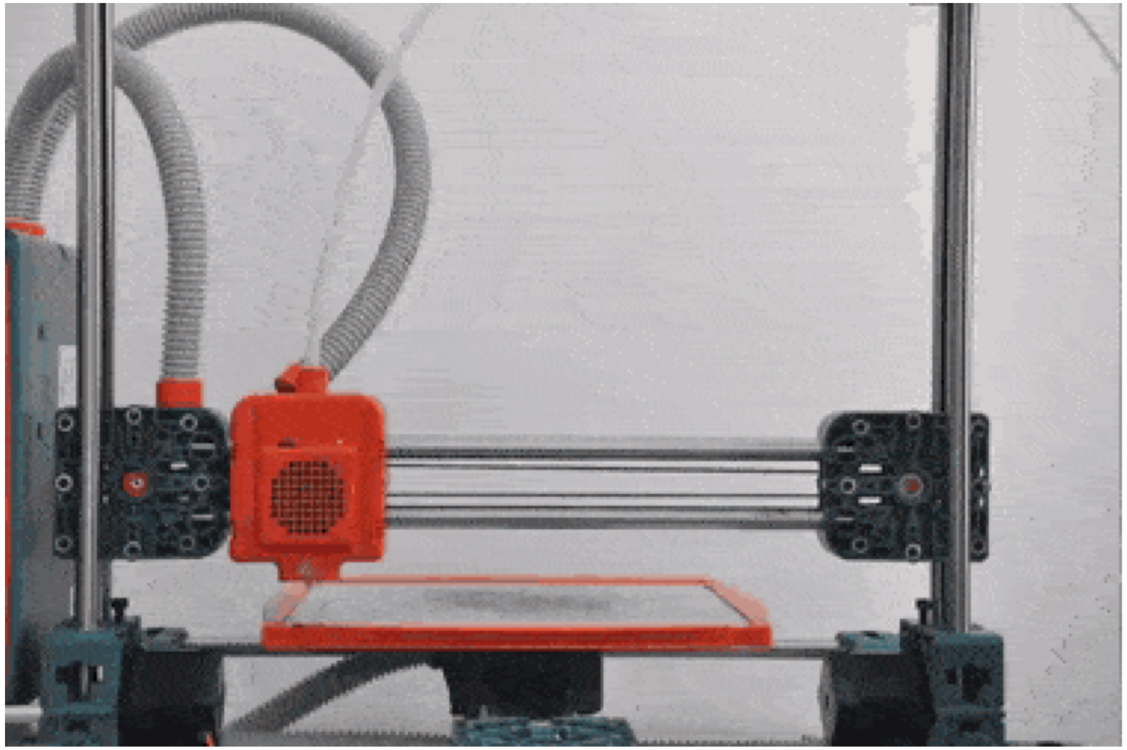
https://www.youtube.com/watch?v=o6RP5n93lFo

Additive Manufacturing

Starting with nothing

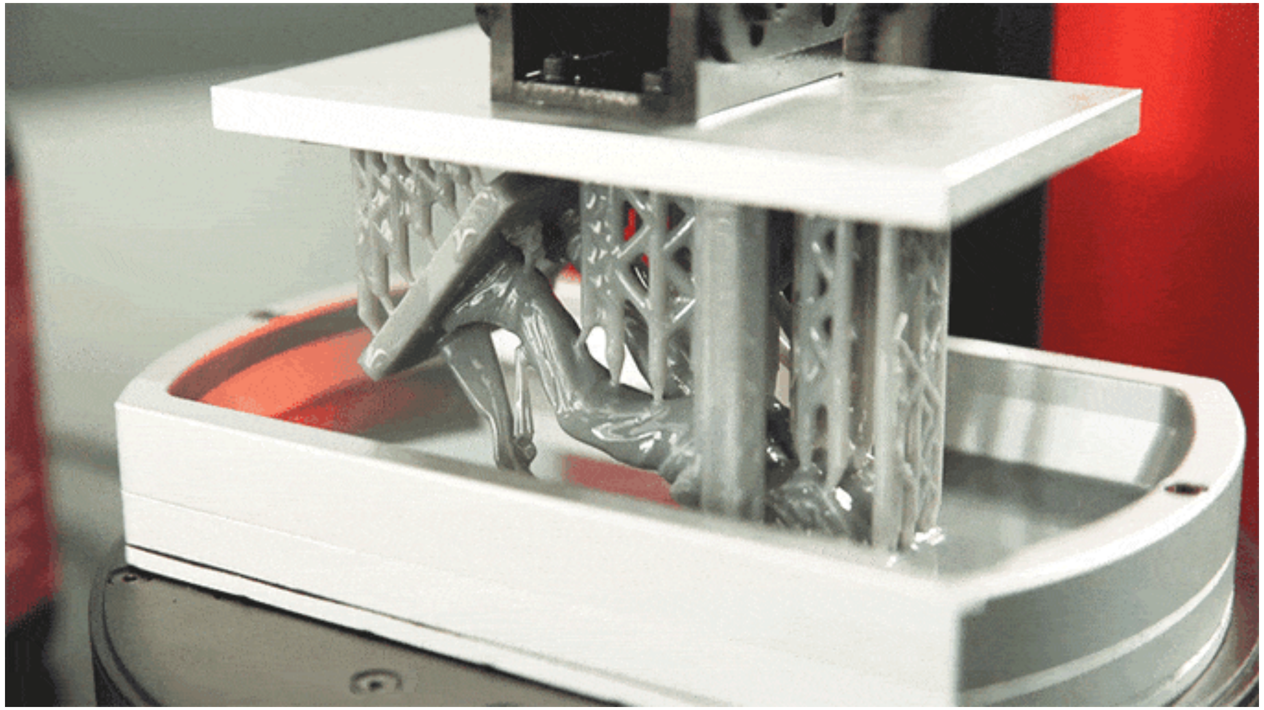
Build the model up

Additive Manufacturing



https://pick3dprinter.com/fdm-vs-sla-3d-printer/

Additive Manufacturing



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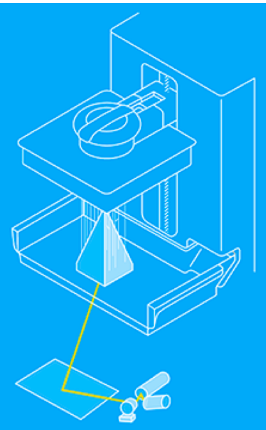
Additive Manufacturing



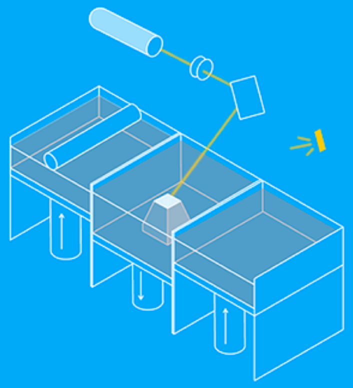
Stereolithography (SLA)

Laser cures photopolymer resin

Highly versatile material selection

Highest resolution and accuracy, fine details

Best for:
Functional prototyping, patterns, molds, and tooling



Selective Laser Sintering (SLS)

Laser fuses polymer powder

Low cost per part, high productivity, and no support structures

Excellent mechanical properties resembling injection-molded parts

Best for:
Functional prototyping and custom manufacturing

https://formlabs.com/blog/fdm-vs-sla-vs-sls-how-to-choose-the-right-3d-printing-technology/

Additive Manufacturing

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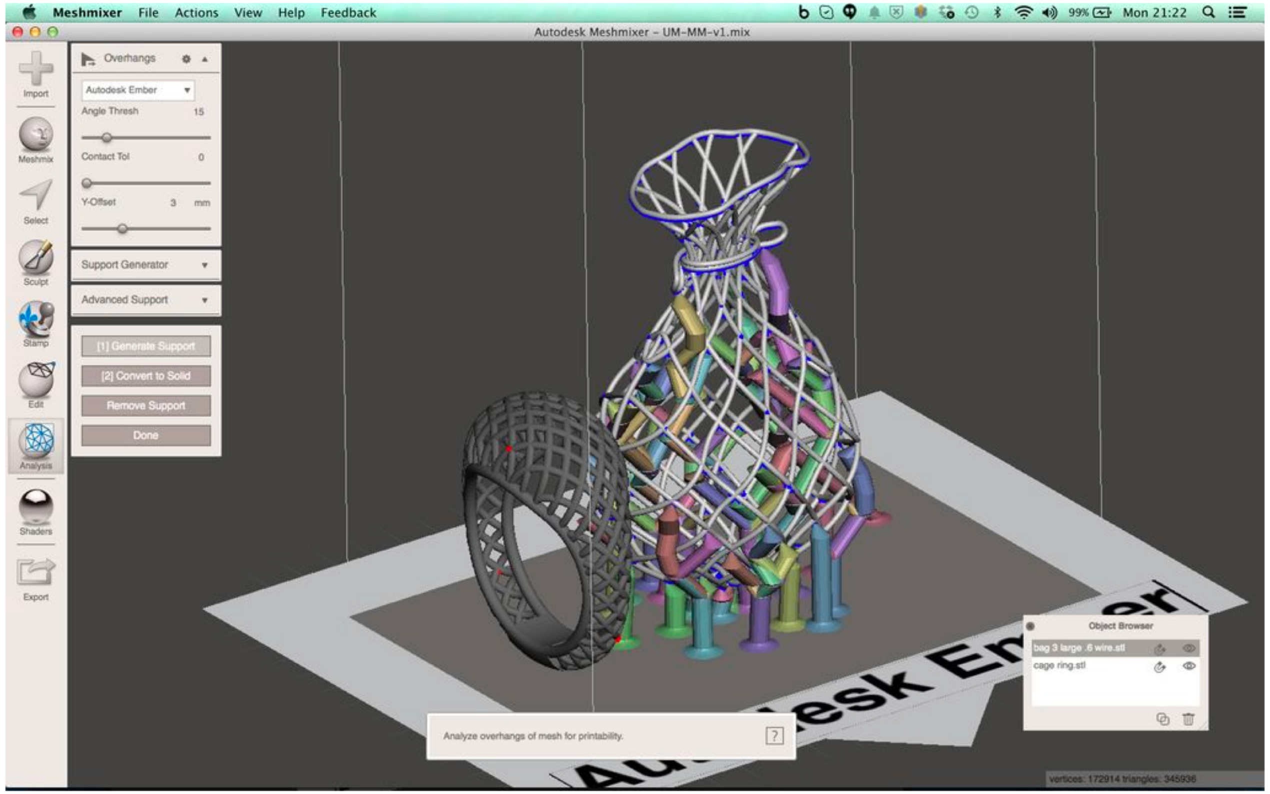
Additive Manufacturing

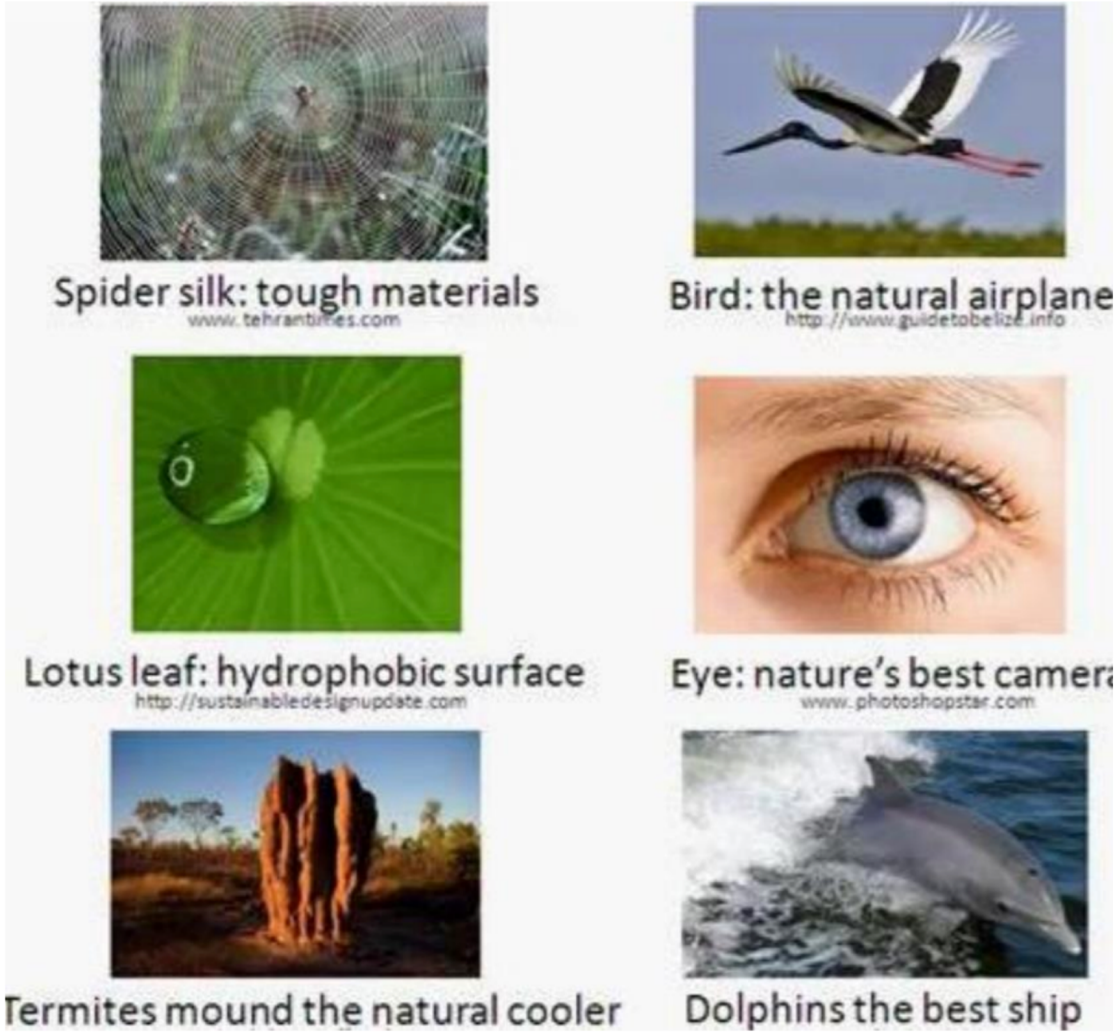


https://manufactur3dmag.com/3d-printing-technology-choice-fdm-v-s-sla-v-s-sls/

Challenges: Physical

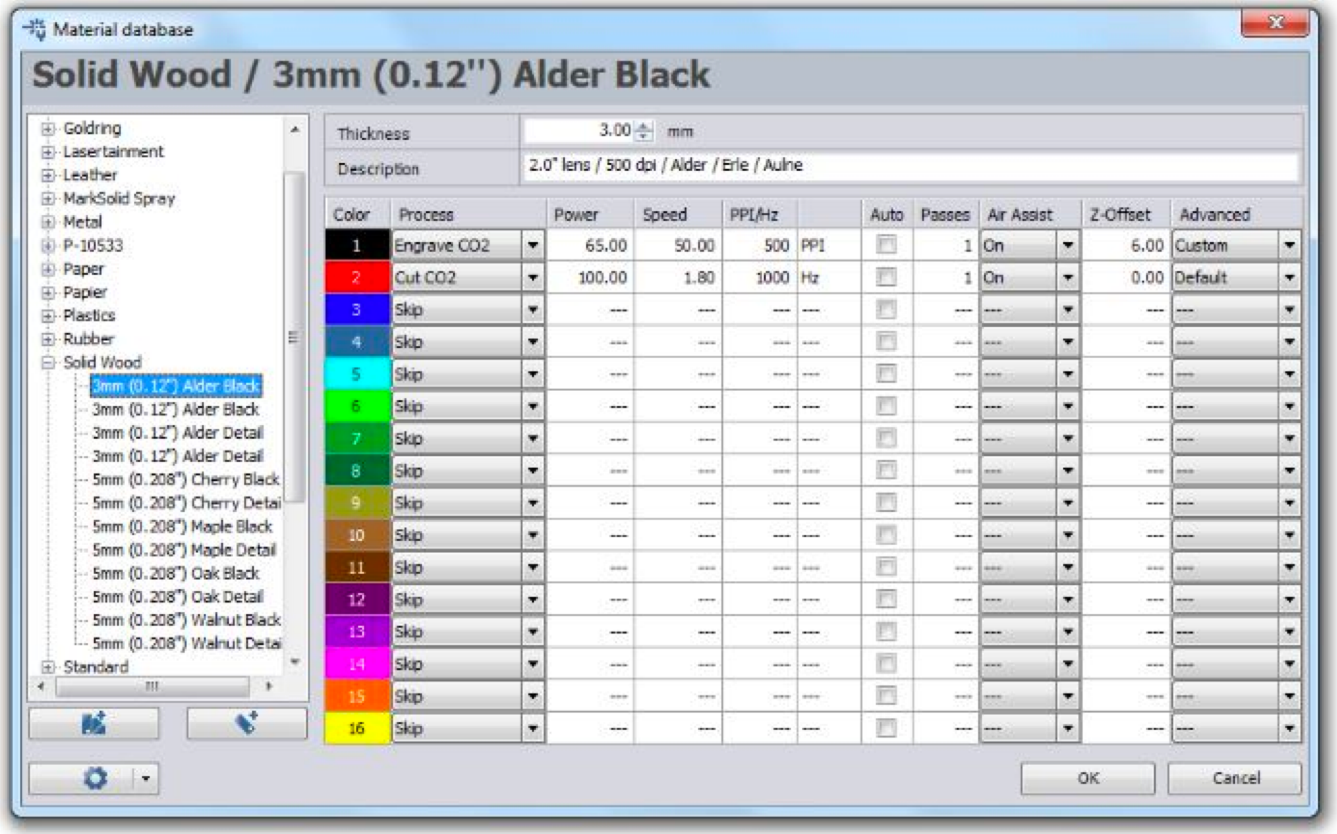
Challenges: Physical

- Material Challenges
  - Better control over physical properties:
    - Strength / weight
    - Deformability (stretchy, flexible)
    - Magnetism, conductivity
    - Heat resistance and transfer
  - Better control over optical properties:
    - Color
    - Shininess
    - Reflectivity
    - Roughness
    - Translucency
    - BRDF…
  - Interface between materials



https://www.cs.tau.ac.il/~dcor/Graphics/cg-slides/Introduction%20to%20Computational%20Fabrication.pdf

Challenges: Digital

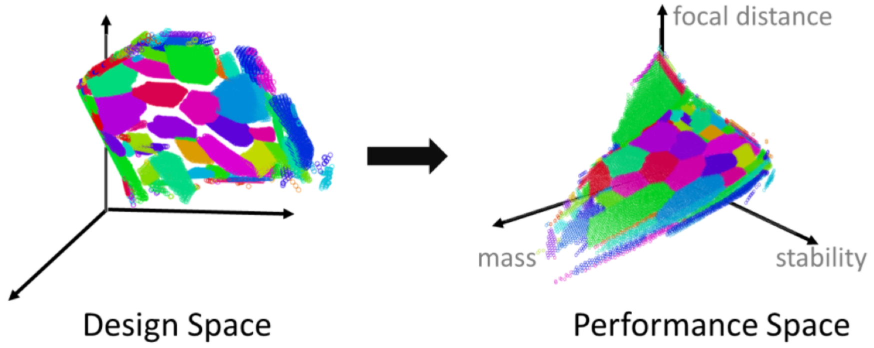


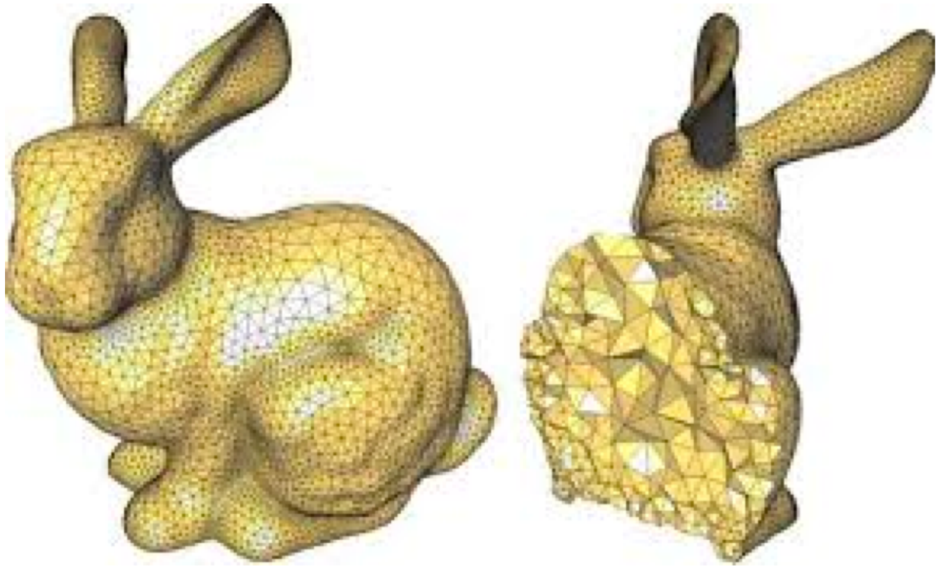
Challenges: Digital

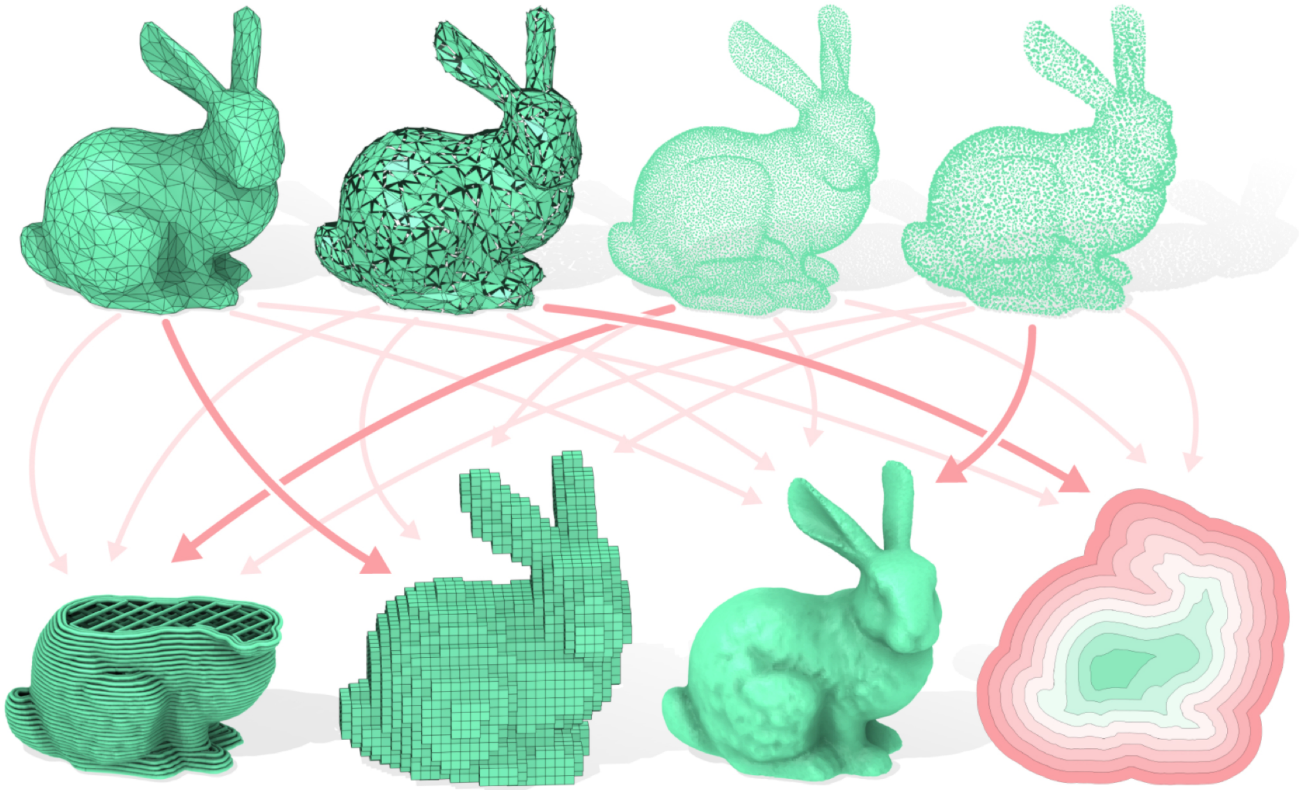
Optimization of certain properties

Simulation

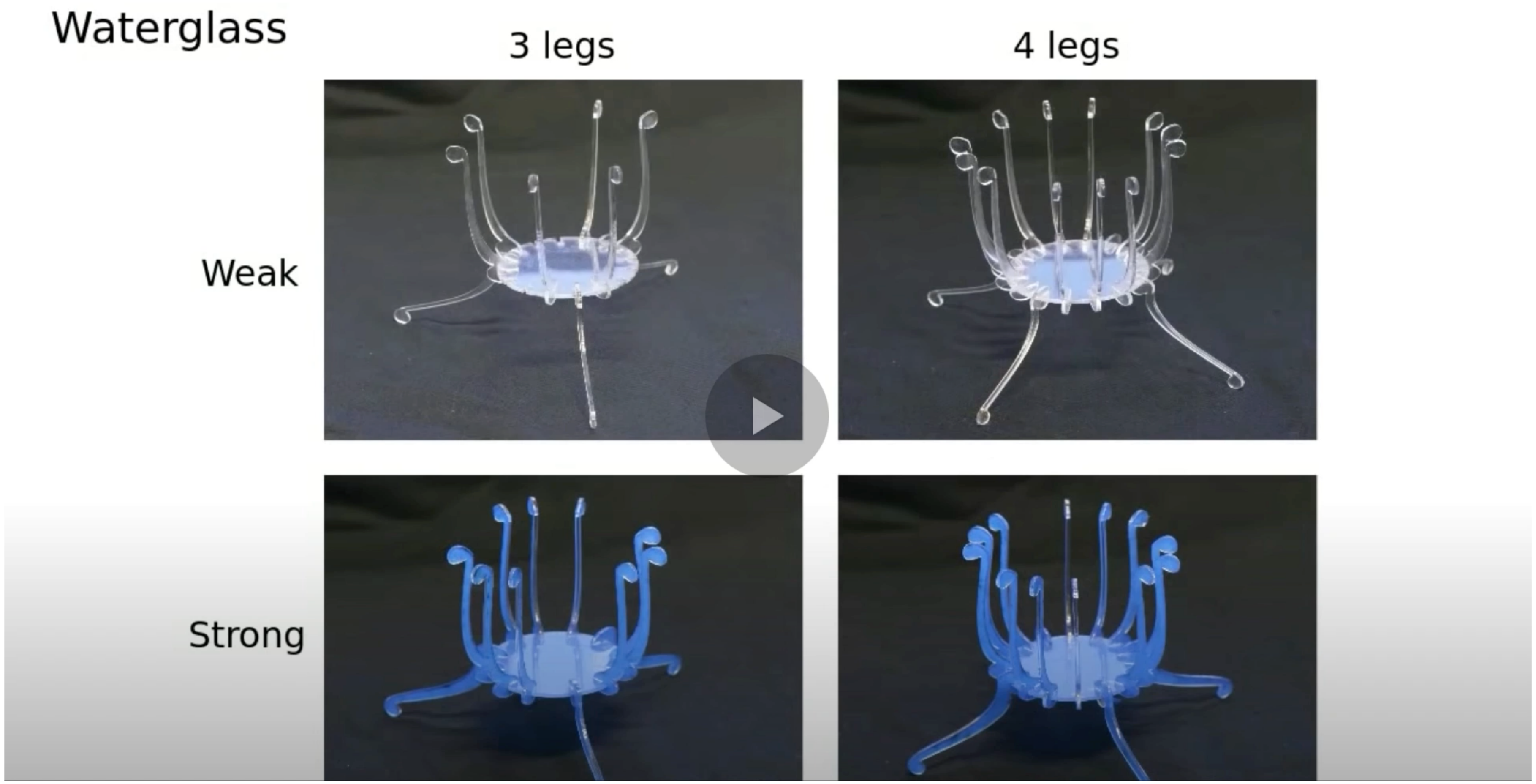
Different representations







Some cool papers



http://flatfab.com/
https://www.youtube.com/watch?v=dN4LNAsGdB0
http://www.dgp.toronto.edu/~mccrae/projects/flatfitfab/paper/flatfitfab_2014_07_17.pdf

Some cool papers

https://jzehnder.me/publications/curveNetworks/CurveNetworks.pdf

Some cool papers

https://igl.ethz.ch/projects/make-it-stand/make-it-stand-siggraph-2013-prevost-et-al.pdf

Some cool papers

https://homes.cs.washington.edu/~adriana/tradeoffs/index.html

Some cool papers

https://hcie.csail.mit.edu/research/platener/platener.html

Some cool papers

http://www-labs.iro.umontreal.ca/~bernhard/Projects/KPS/KPS.html

Some cool papers

https://cims.nyu.edu/gcl/papers/mimicking-2014.pdf

Done for Today

Office hours: Right now for A8