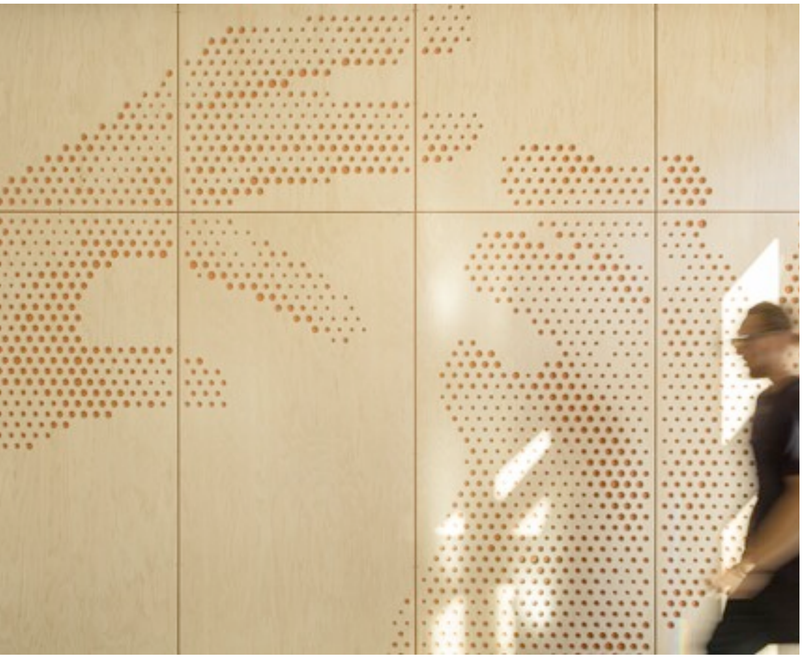
CS181DT Class 6: Digital fabrication



CNC milled wood wall boards showing hands, UC Berkeley Jacobs Hall

Compostable Lamp from 3D printed orange peels by Krill Design

Laser-cut puzzle from Nervous System

Class 5 agenda

- ZC x 2
- PM2: Sensory Cardboard crit
- Mini lecture: CAD-CAM process
- Break
- PM3 details; more on laser cutting
- Vector graphics studio

PM2 Crit

PM2 art walk

Squishy • Revolting • Light

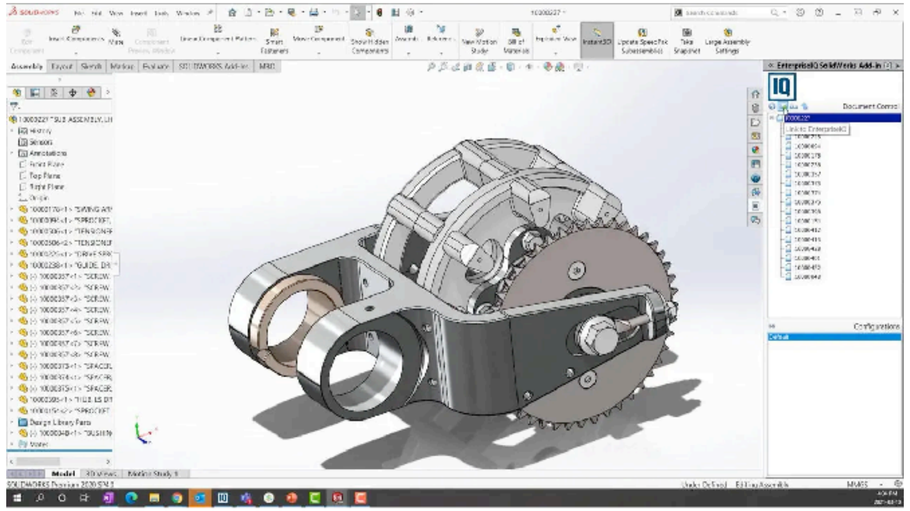
- (2 min) **Phase I:** Place your cardboard on the table. Optional: write anything you'd like others to know (your vision, how to interact, etc.) on the post-its by your piece(s). Don't write your name.
- (12 min) **Phase II**: Walk around the room looking at your classmates' pieces. Give out at least **6** index cards of anonymous feedback. Each cardboard piece should at least have 2 index cards of feedback! Mention (1) how you think this piece is capturing the prompt (2) one thing you like and any other comments or questions.
- (3 min) **Phase III**: Take time to read your feedback. If you'd like to respond to any comments to the whole class, now's your chance.

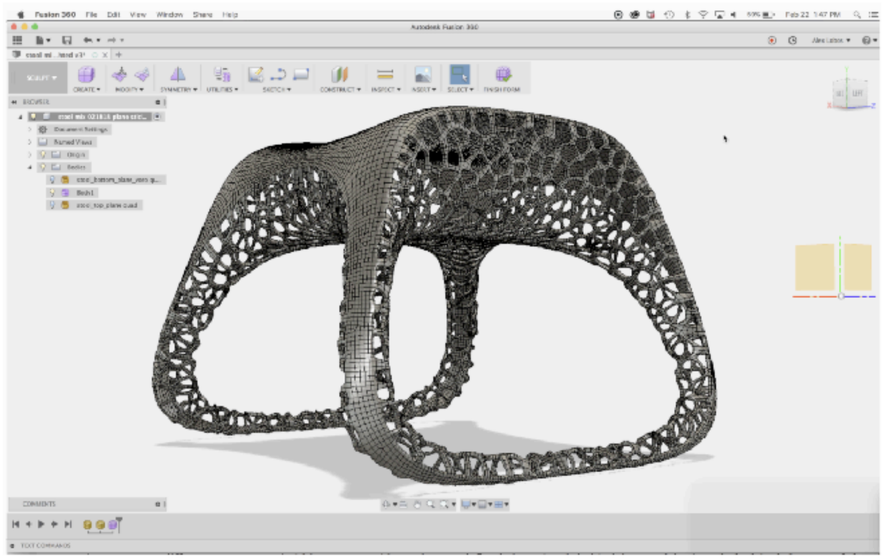
Digital Fabrication

Most things around you are digitally fabricated

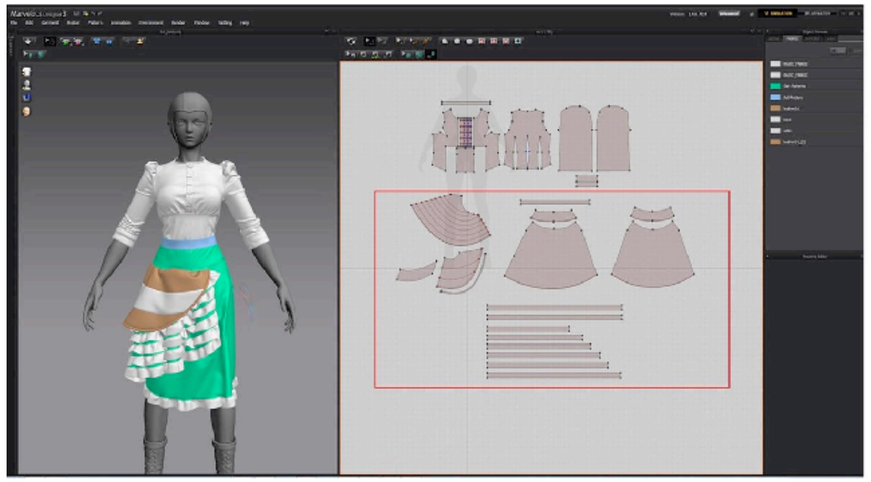
- But designed by humans, usually on computer software: computer-aided design (CAD)

CAD abstracts design from manufacturing

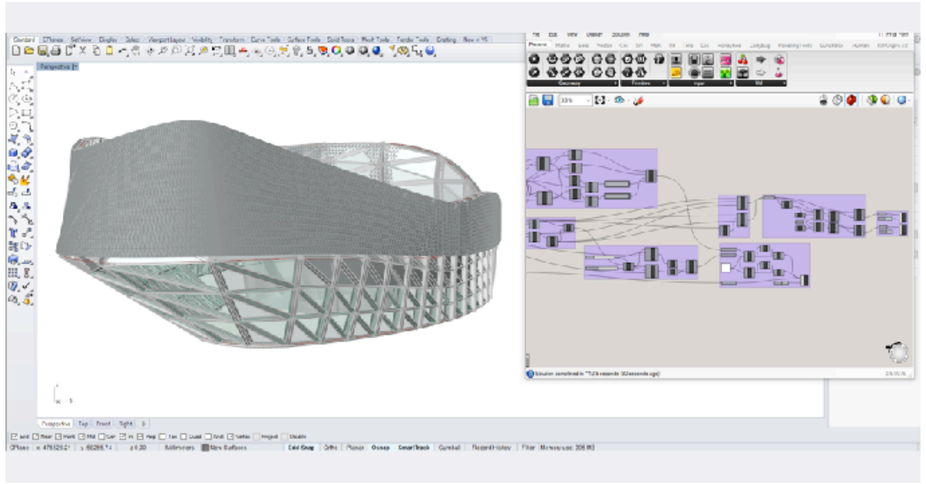




Solidworks, Fusion360 (3D models)



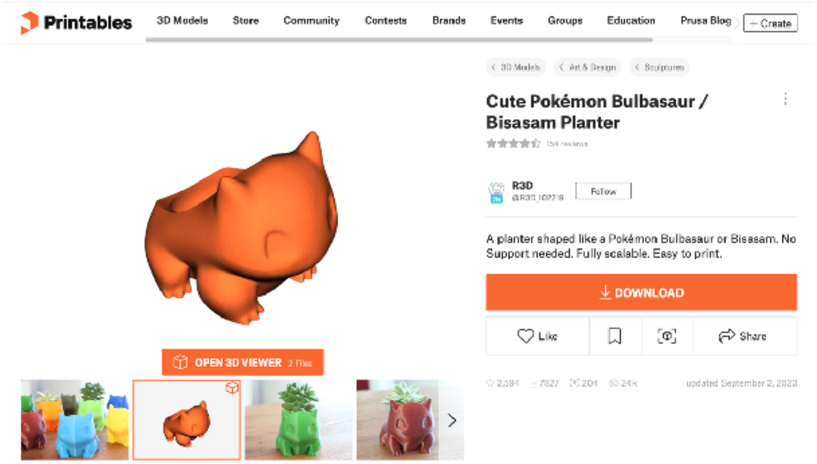
Marvelous Designer (fashion)

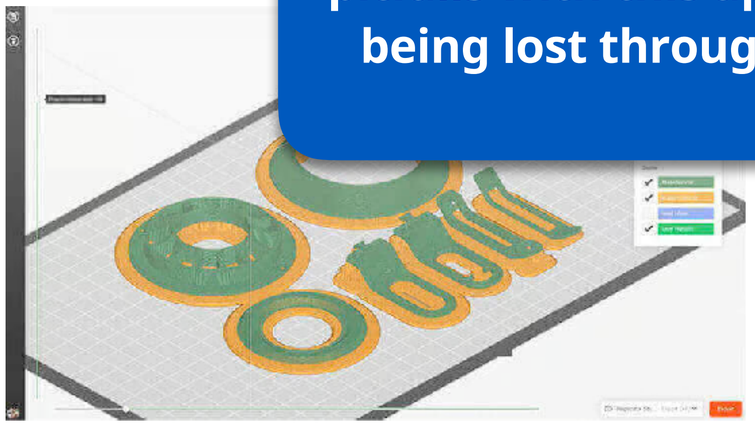


Grasshopper (architecture, generative art)

CAD -> CAM cycle

What are some advantages and pitfalls with this approach? What's being lost through abstraction?





Design a software representation of what we want to make

Computer-aided design (CAD)

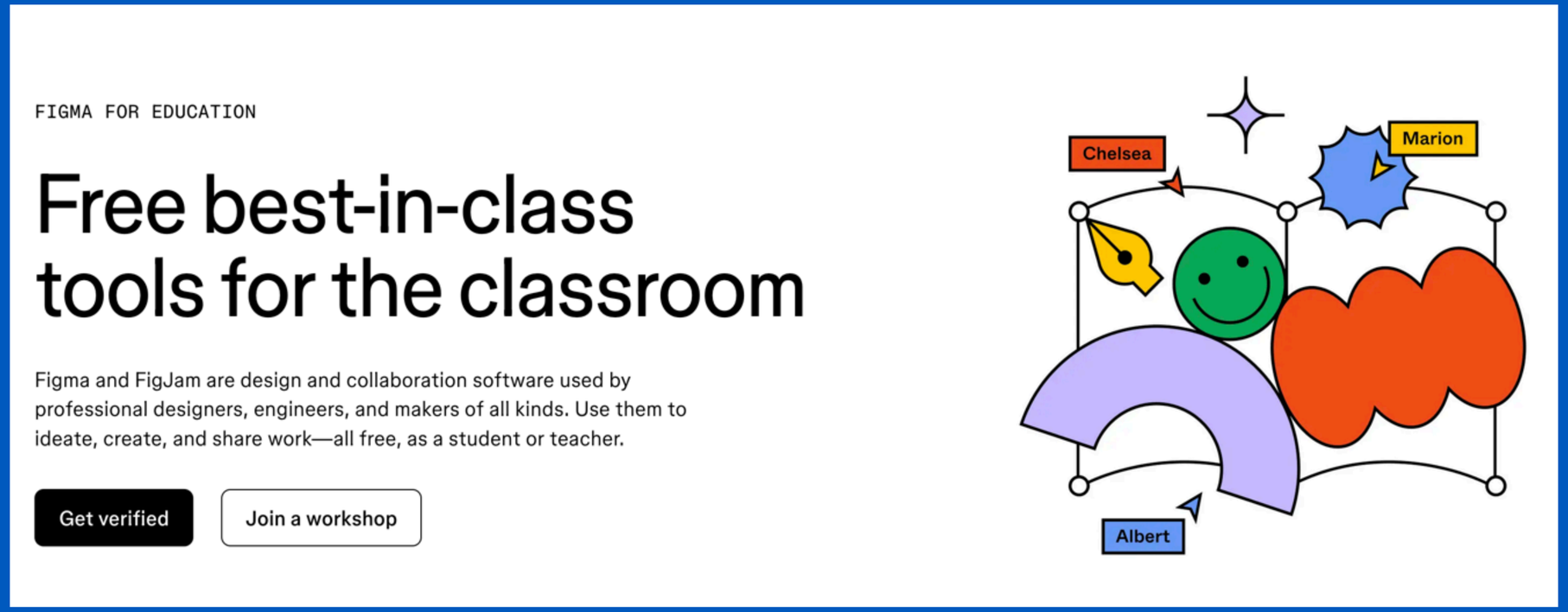
Turn our software representation into machine paths

Computer-aided manufacturing (CAM)

The machine will do the actual "making", humans do the "design"

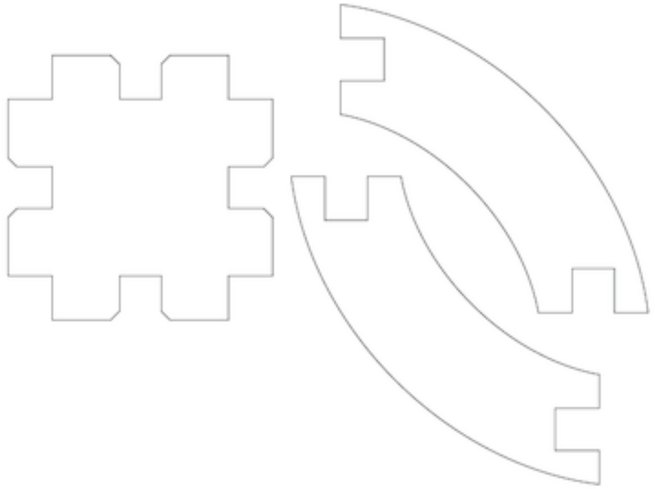
Making no longer requires physical skill (the machine will do it), but just design skill

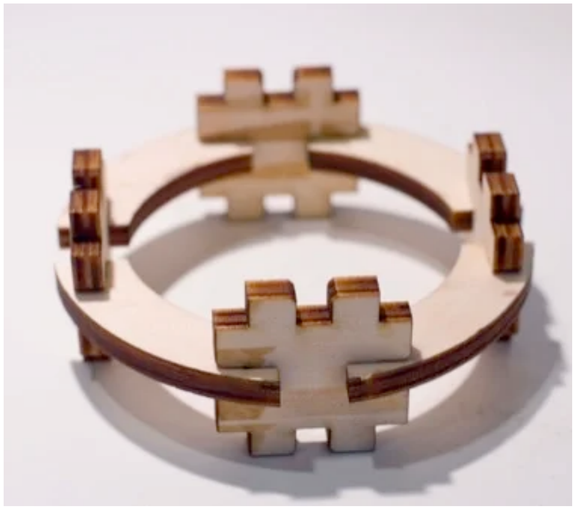
Break

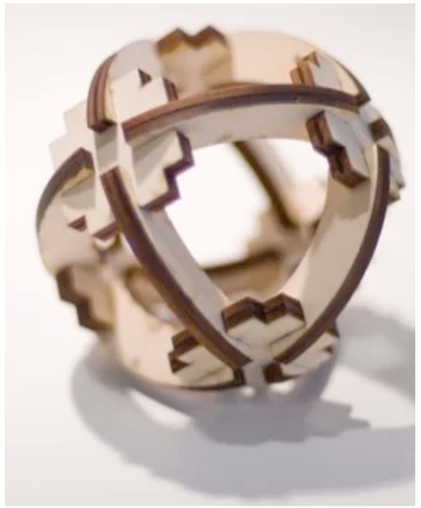


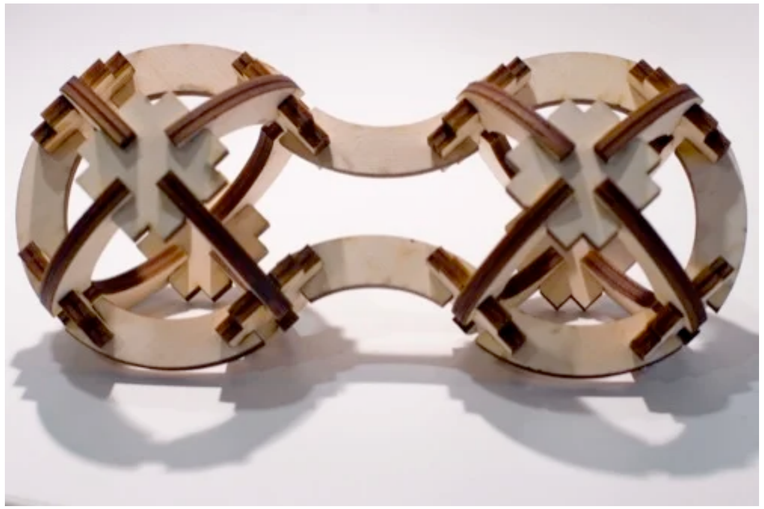
https://www.figma.com/education/ Get a Figma education account

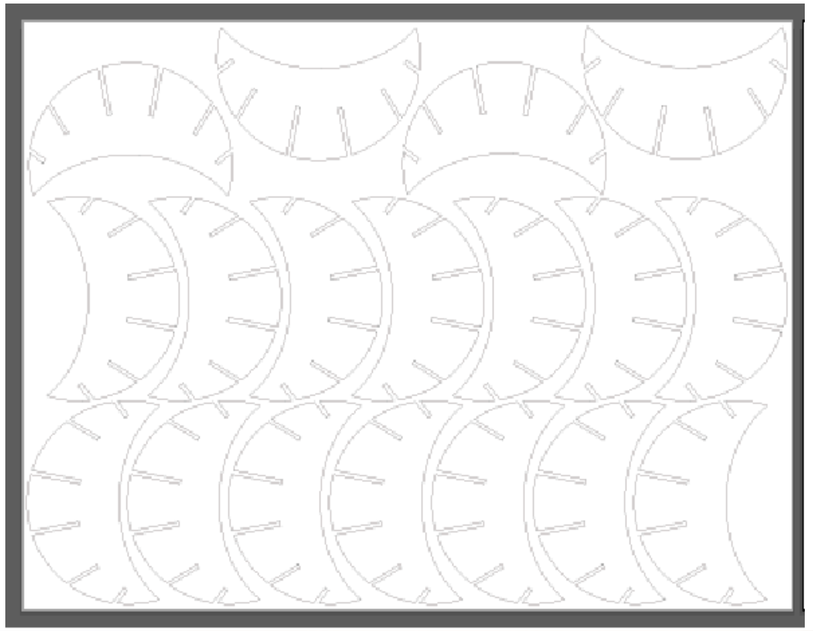
PM3: Press Fit Kit

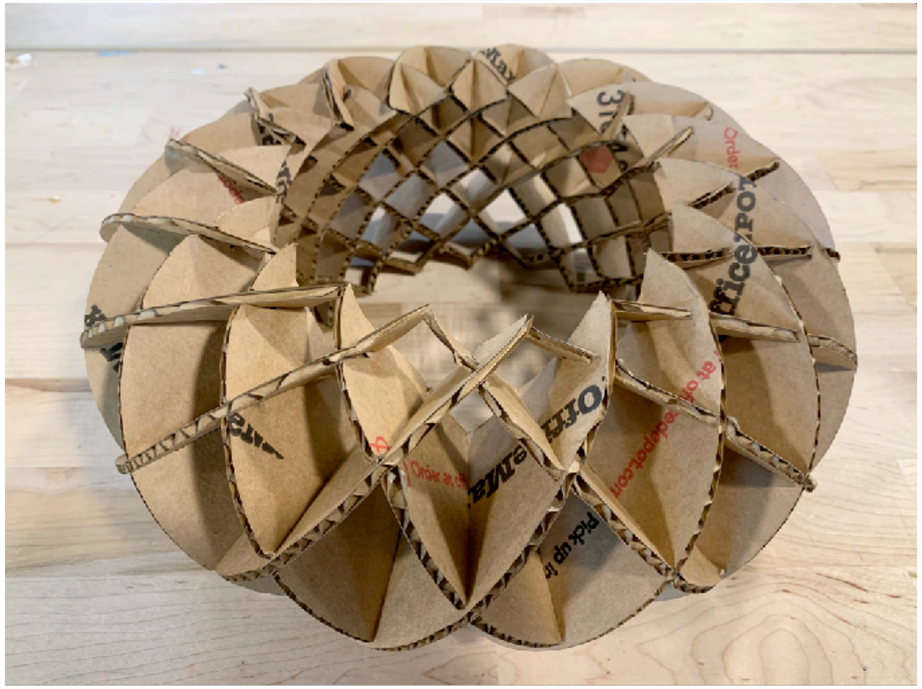










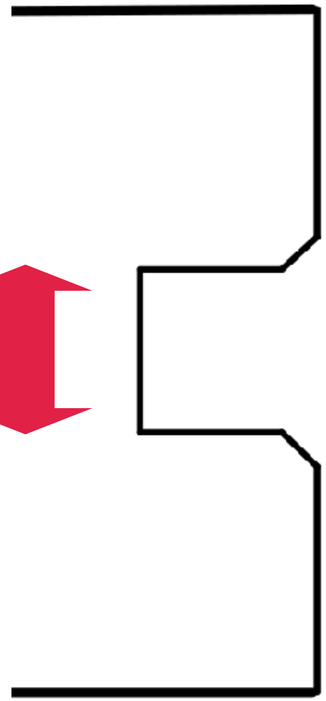


By Hannah Nursalim, https://hcnursalim.github.io/assignment1.html

By Kellie Dunn, https://kelliead.github.io/assignment1.html

Designing accurate press fits: measure twice

Thickness of material



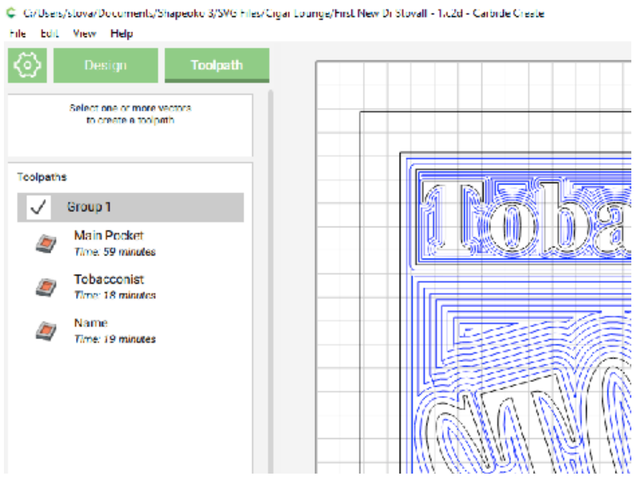
45° notches (chamfer) to help guide the material in

Cutting from 12 x 17.5 birch plywood: make sure your design fits in less space than that!

Studio: More on Laser Cutting

Use a vector program (Inkscape, Illustrator, Figma) to draw shapes we want cut

Computer-aided design (CAD)



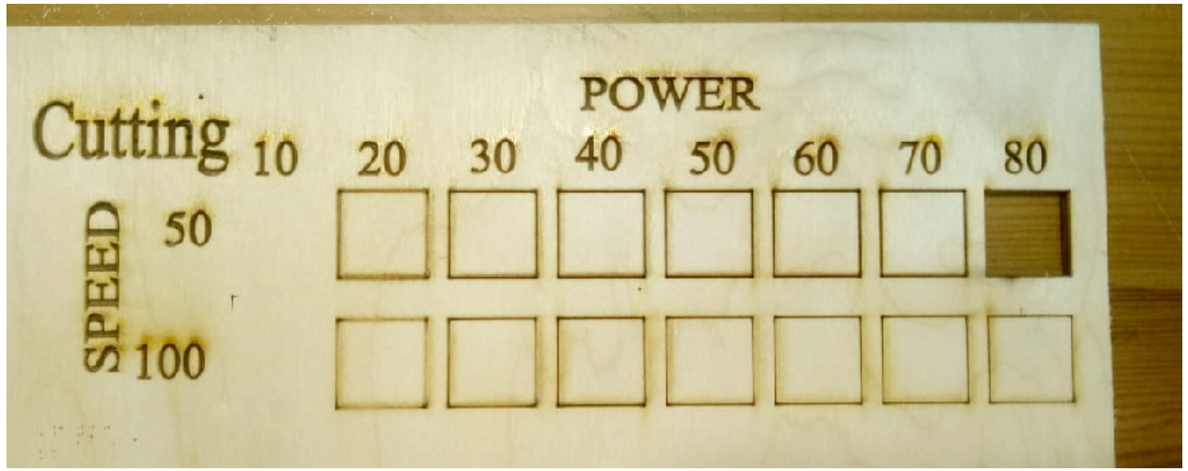
On the makerspace computer, convert design to toolpaths on the laser cutter, which converts it to motor movements. Also specify cut settings

Computer-aided manufacturing (CAM)

Cut the piece & don't start a fire

Laser Cutting terminology/settings

Cutting vs engraging/scoring

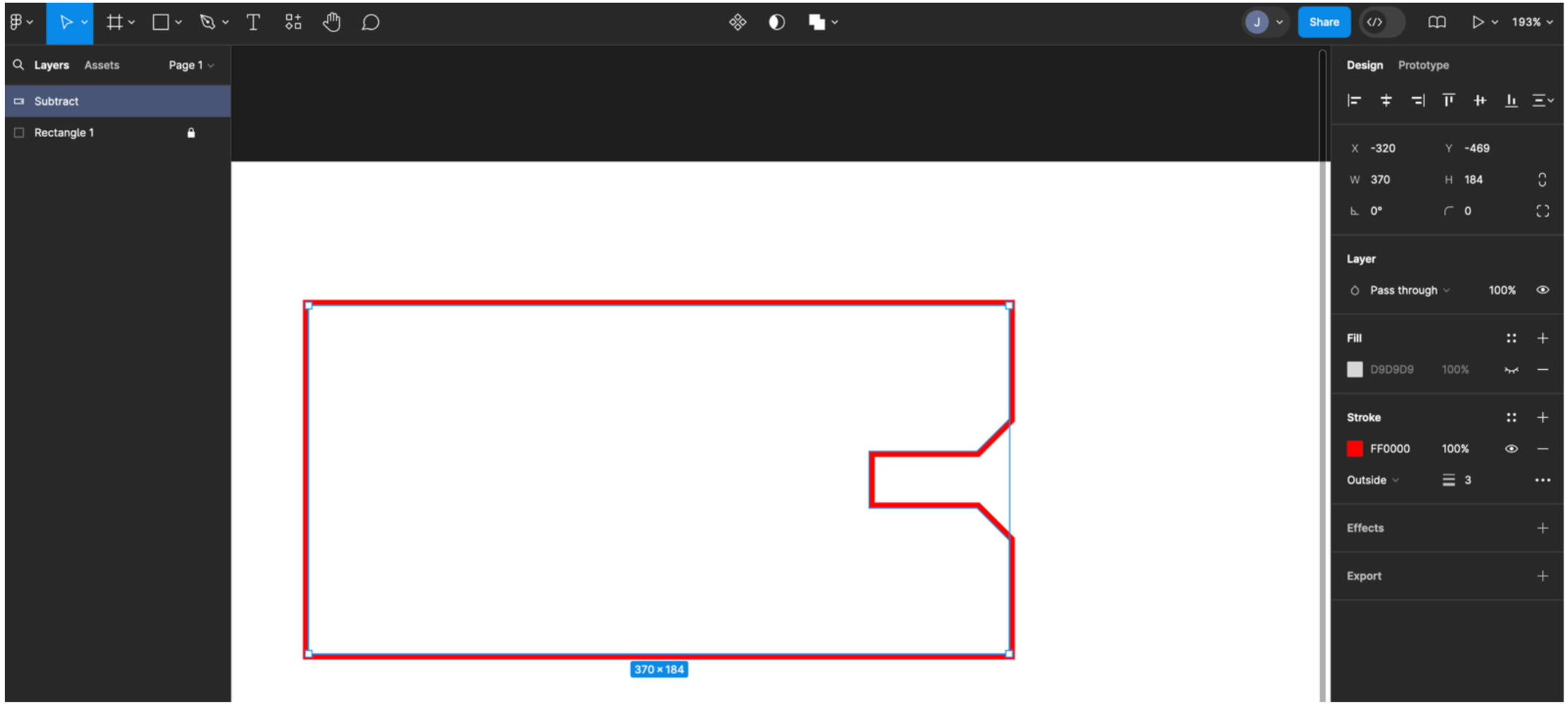


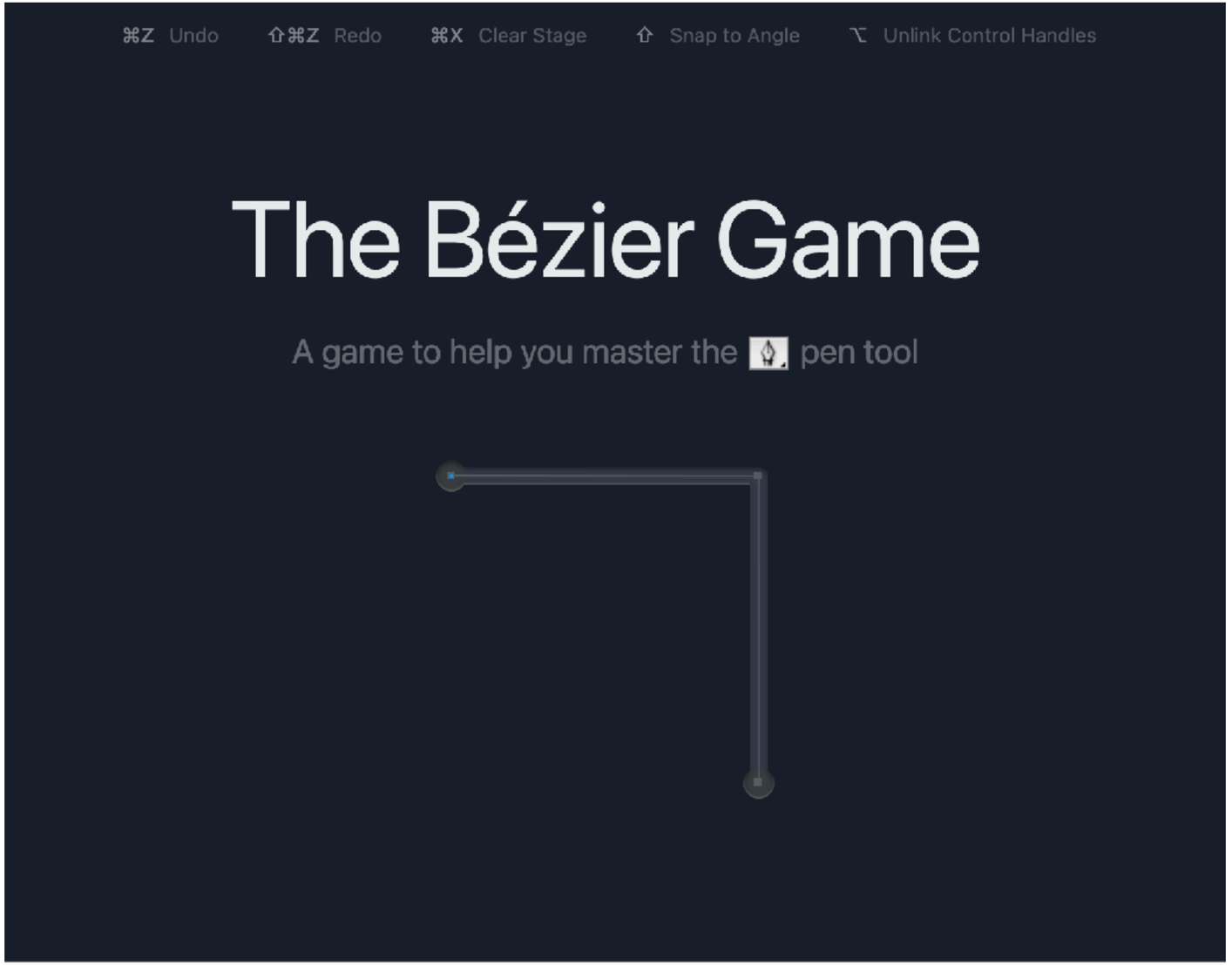
Power & speed

Kerf

How much material is actually removed by the cut

Vector graphics tutorial (in Figma)



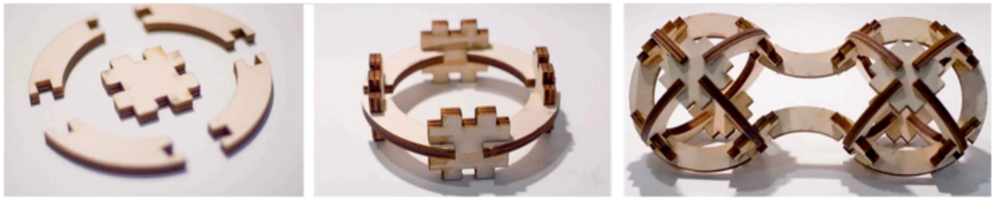


https://bezier.method.ac/

Class 5 recap

- TODOs:
  - By **Wednesday's** class:
    - HMC makerspace training - make.hmc.edu
  - PM3 is due in 2 weeks, but that's to give everyone ample time to use the laser cutter - *get started early!*
- We can meet here and walk over together, or directly at the Mudd makerspace at 11:10 next week

Personal Making Assignment 3: Digital Making - Press Fit Kit



This assignment is due in 2 weeks to account for time needed on the laser cutter. Please start early!

In this assignment, you are to use the laser cutter to make a **press fit kit**: an assembled 3D structure that works through friction fit joints and requires no adhesive. The goal of this assignment is to gain familiarity with the CAD-CAM cycle and digital fabrication processes. As such, in addition to your final object (and to get you to practice for Proj 1), you will also be submitting a write up and documentation of the design *process* as you go along.

In your documentation, please include

- Intermediate photos of the process, including
  - A screenshot of your vector file
  - (Optional but highly recommended) photos of any test cut pieces you did
  - A photo of your pieces cut out and laid flat
  - Photos of your pieces assembled in at least **two** different ways. You can have a "final vision" or intended object, but you should also show an alternate way the pieces can be fit together, even if it isn't in line with your vision.
- Settings: What power and speed settings did you use on the laser cutter? Did you have issues with fires or scorching?
- Acknowledgements: List any online resources you used, modified, or got inspiration from. List any people (such as makerspace stewards) you got help from.
- Reflection paragraph: How did this assignment match up to your initial expectations? What was the most challenging part? What did you learn about interacting with fabrication machines? Were there any parts you had to redo, or lessons you learned for the future?

Remember, the thickness of your slots will be determined by the thickness of the plywood you cut. Every piece of plywood is different so it's very important to take accurate measurements with a caliper.