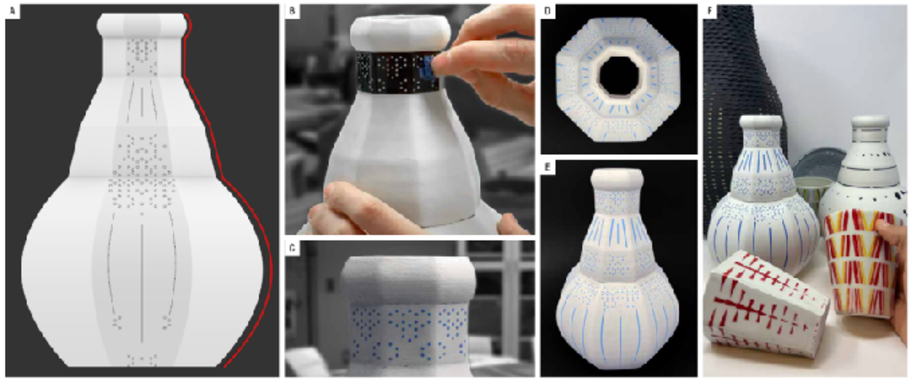
CS181DT Class 10: Design tools for DFAB

(our first foray into HCI research)

Polagons by Sethapakdi et al. (CHI 2023)

Aesthetic Electronics by Lo et al. (UIST 2016)



CeramWrap by Toka et al. (UIST 2023)

Class 10 agenda

- Reviewing module 1
- PM3 artwalk!
- Lecture: a very brief history of HCI research
- Break
- Seminar: digital fabrication research
- Lecture: more digital fabrication tools

Revisiting learning goals

The **learning outcomes** of this course are that students will:

- develop a critical understanding of past and present making technologies and design tools, and their roles within current cultural and social contexts ✅ *(partially)*
- make expressive and interactive objects and tools that critique and advance computing culture ✅ *(partially)*
- establish proficiency with the fundamental concepts, methods, and practices of physical modeling, sketching, form giving, and hands-on making across a range of materials ✅
- be able to evaluate tools and interactive systems with quantitative and qualitative methods understand and critique social, ethnographic, engineering, and design-oriented research practices ❌
- improve their capacity to motivate and frame HCI research questions and contributions ❌
- improve their presentation and feedback skills through in class studio critiques ✅

Making tools (weeks 5-11)

- Learning the human centered design process, similar to other HCI or UI/UX courses
- Start with reviewing existing computational design tools created in research, before you brainstorm your own to make!
- For the first bit, we will focus more on tool design and interaction. Later in the semester we'll be talking about technical feasibility (and doing a lot of implementation)
- Reminder: you have 7 late days without penalty, it's OK to take a breather

PM3 Artwalk

Press Fit Kit Lightning Crit (8 min)

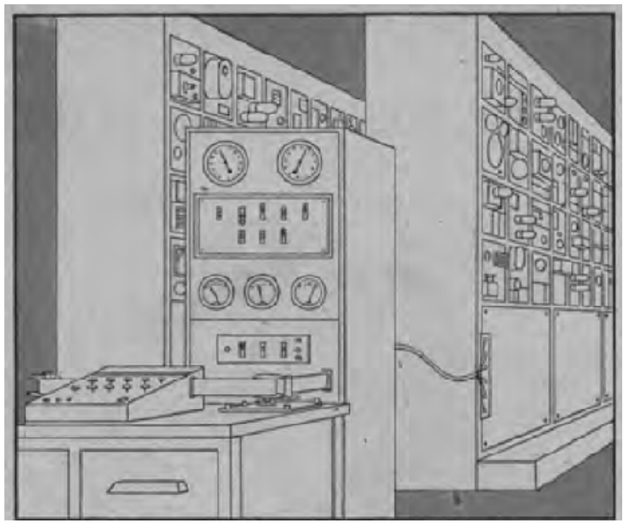
- 1 post-it + 4 index cards
- On the post-it, write how many sheets of new plywood you used and any messages to your audience
  - I’ll collect these at the end so the course can pay the HMC makerspace :)
- 4 index cards: initial impressions for 4 pieces
  - Every piece should have at least 2 comments

A very, very brief introductory history of HCI research

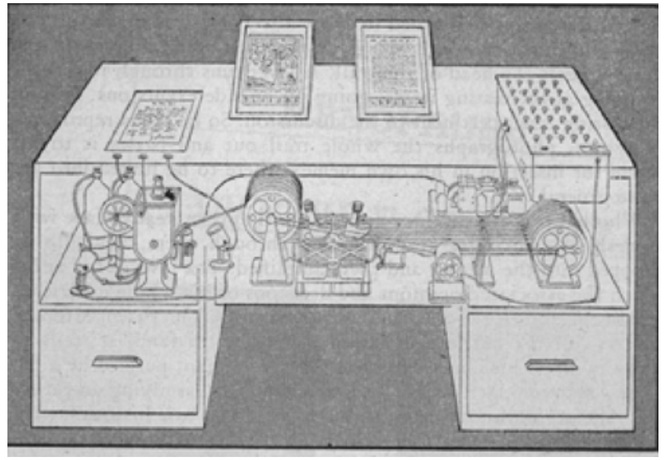
(with slides from Michael Bernstein)

Computers to help us *think*, not just do math

Meta smart glasses



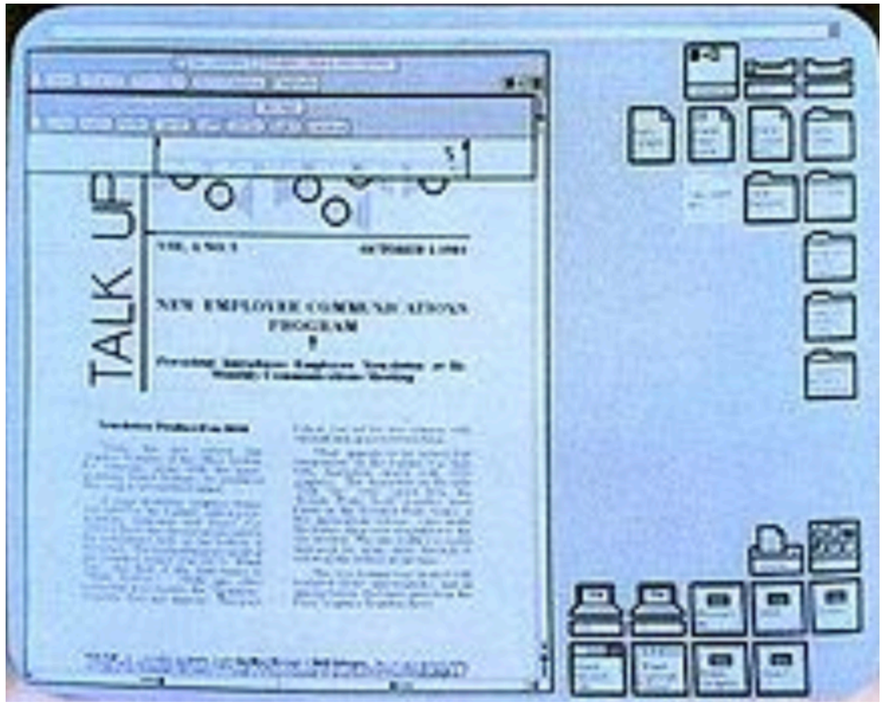
Thinking machines



Memex desk

"Wholly new forms of encyclopedias will appear, ready-made with a mesh of associative trails running through them."

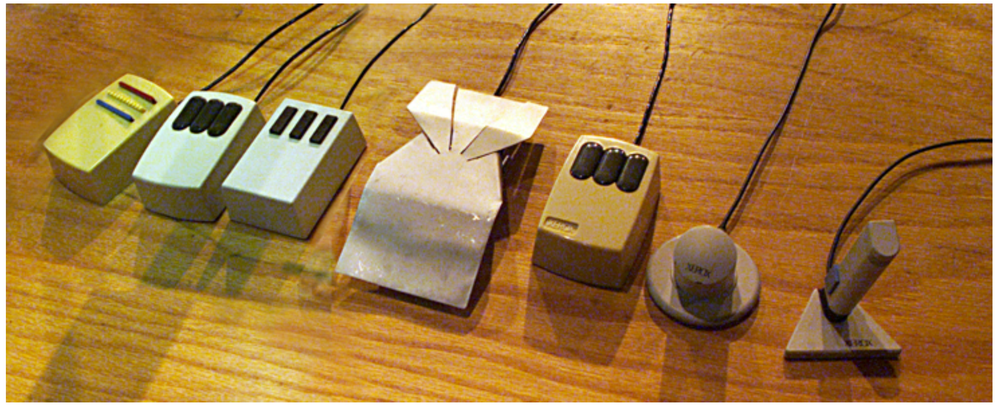
Right after WWII, created lots of funding for CS



The Xerox Alto

Xerox PARC, 1973

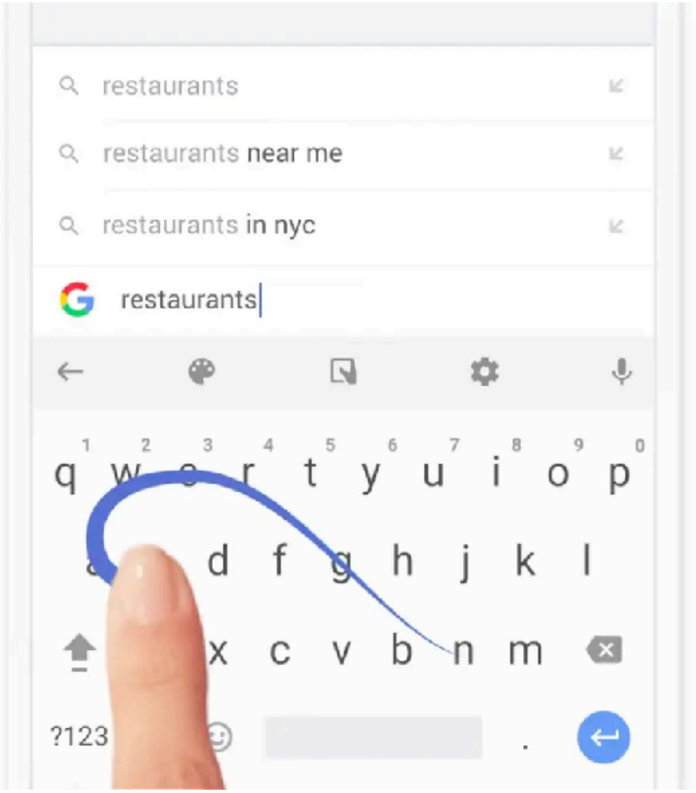
Modern MacOS



Card, English and Burr. *Evaluation of mouse, rate-controlled isometric joystick, step keys, and text keys for text selection on a CRT.* 1978

Modern mouse

Zhai and Kristensson. *Shorthand writing on a stylus keyboard.* 2003

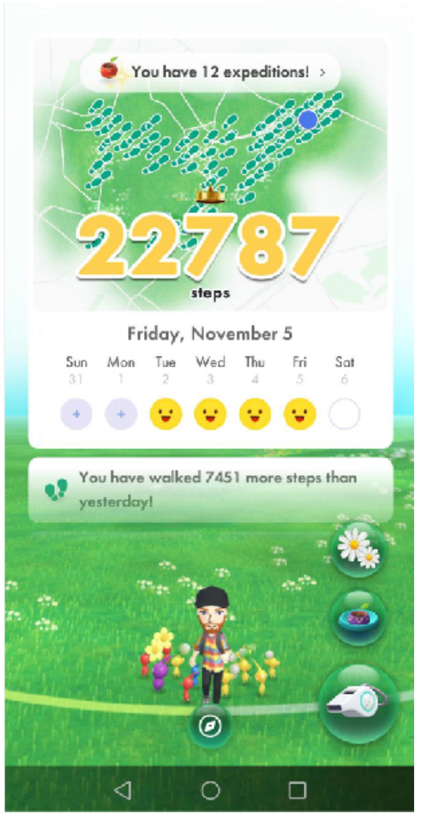


Swipe text keyboards

Fiala. *ARTag, a fiducial marker system using digital techniques*. 2005

QR codes

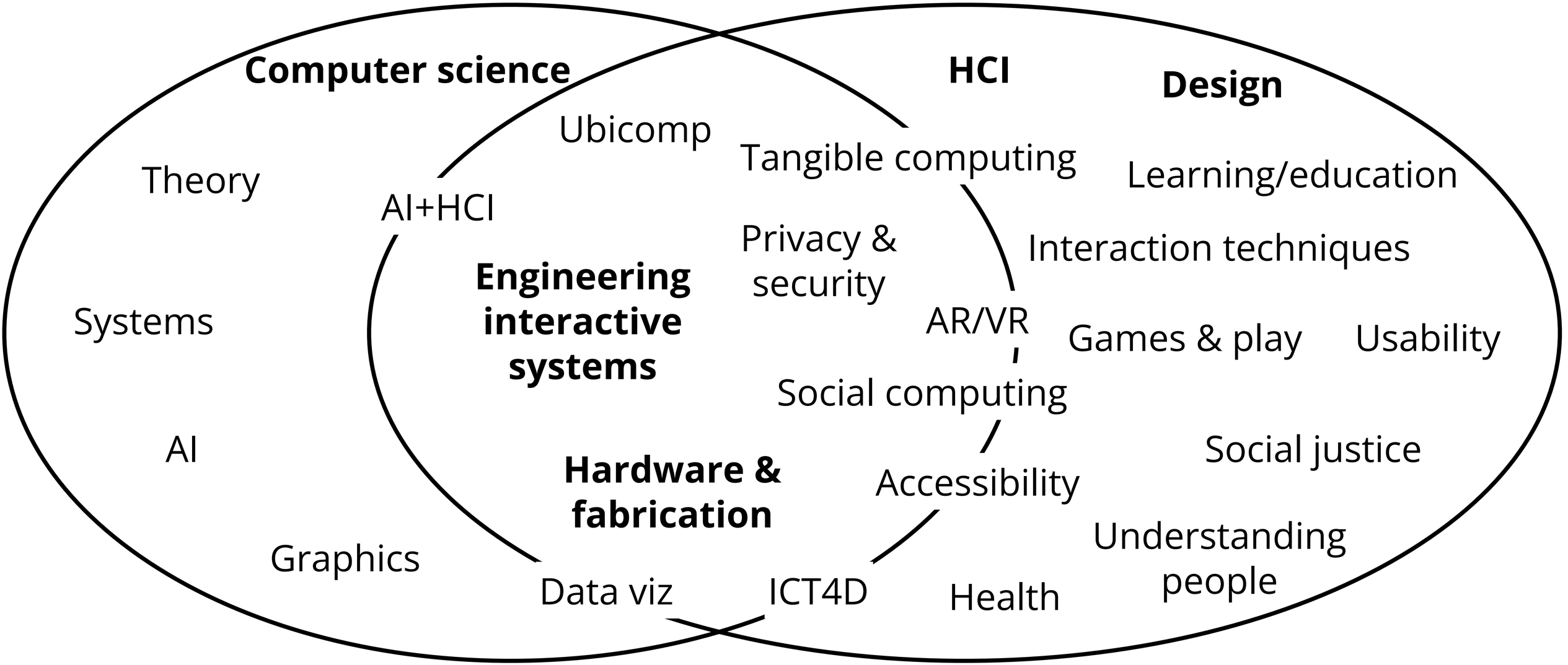
Consolvo et al. *Activity sensing in the wild: a field trial of UbiFit Garden*. 2008



Modern fitness trackers

(and my favorite mobile game, Pikmin Bloom!!)

Research areas of HCI

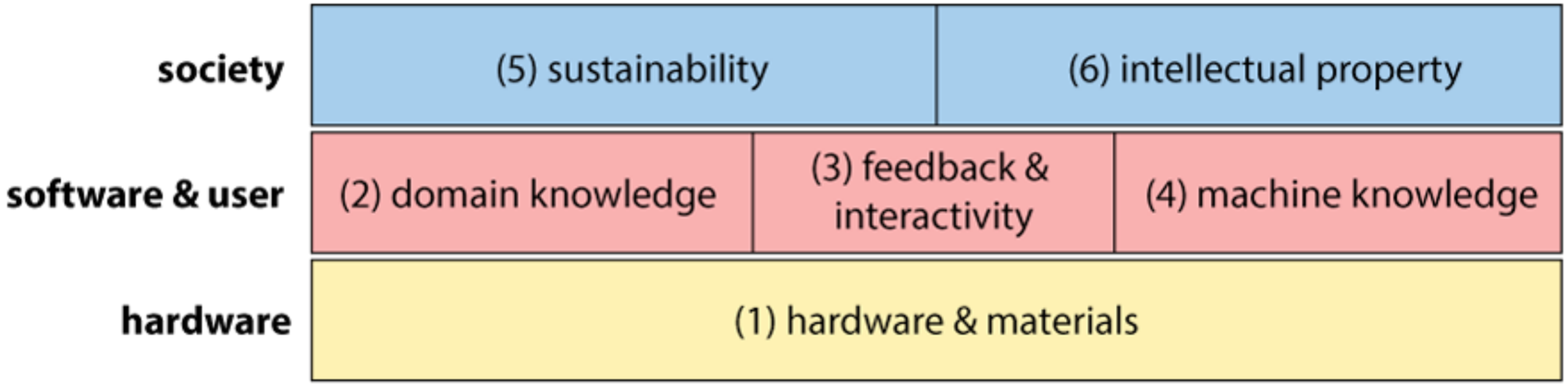


Seminar

Design tools for digital fabrication

Digital fabrication -> Personal fabrication

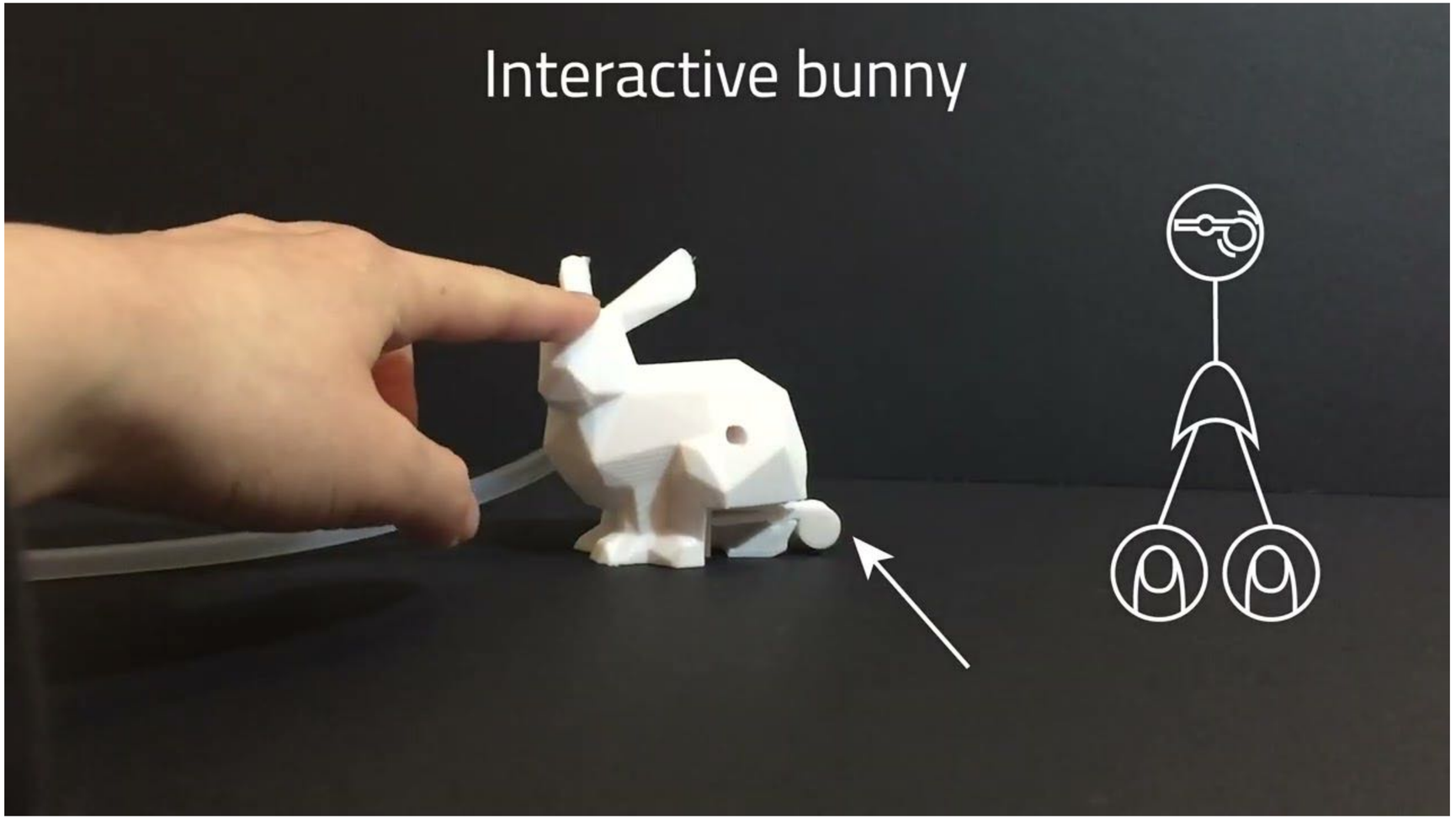
- While there are huge machine fabrication factories and supply chains, most HCI research on digital fabrication focuses on *personal fabrication* at the consumer/hobbyist level
- Most researchers are consumers/hobbyists themselves, the machines are more accessible to labs, and it's much easier to design for a user who is yourself
- (General trend we'll also see in creativity support tools: design for novices)



Hardware & materials

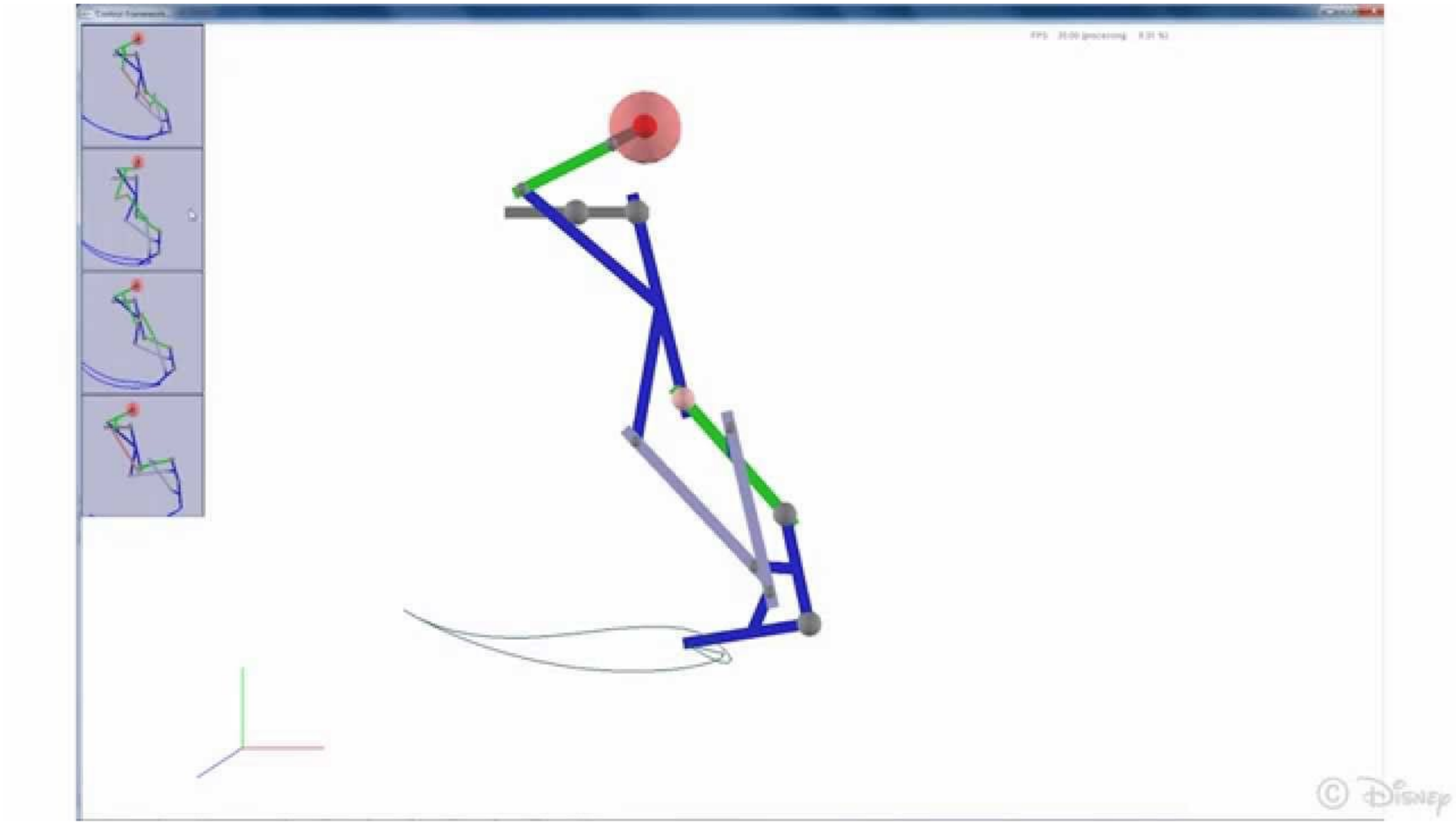
Willis et al. Printed Optics. 2012

Hardware & materials



Savage et al. AirLogic. 2022

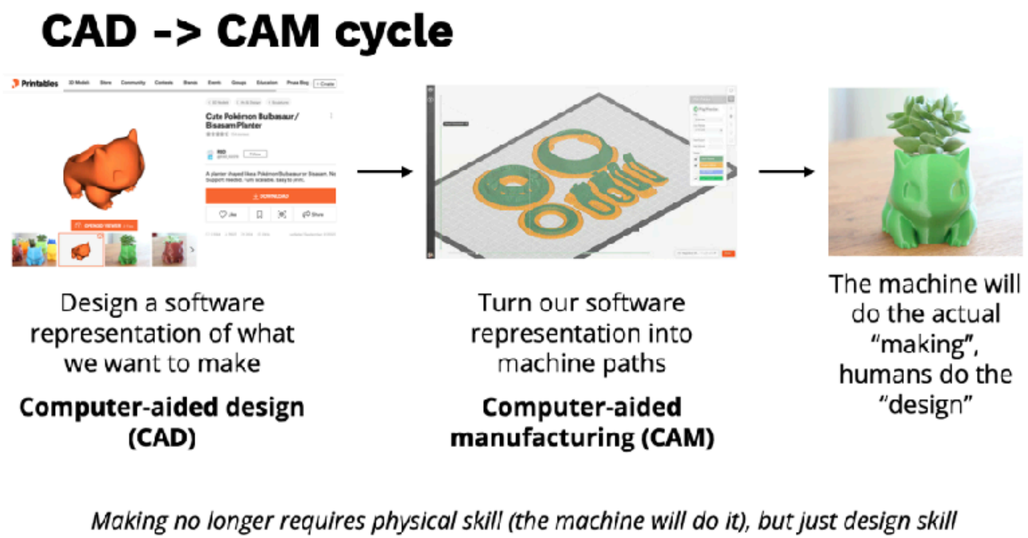
Domain Knowledge (kinematics)



Thomaszewski et al. Computational design of linkage-based characters. 2013

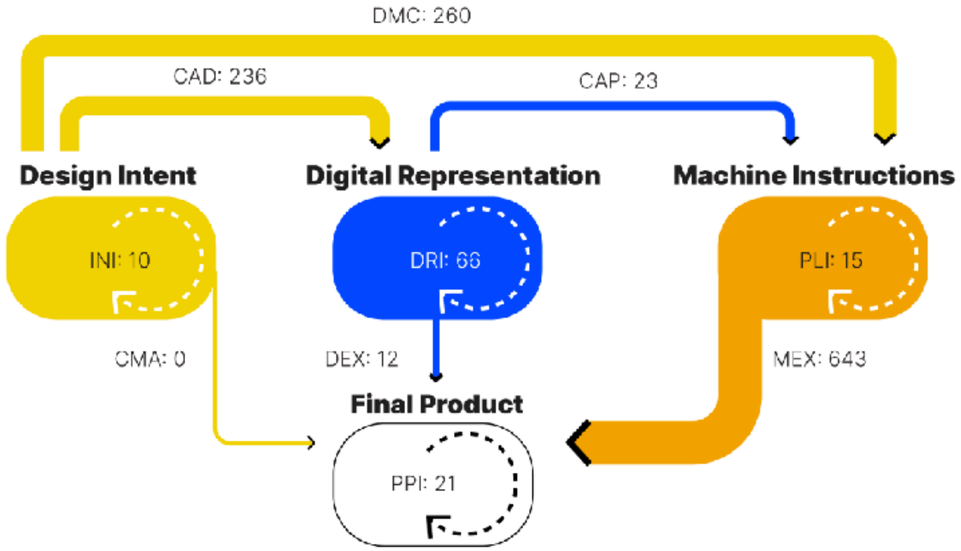
Domain Knowledge (understanding communities)

Instead of this workflow (recall our digital fabrication lecture)...



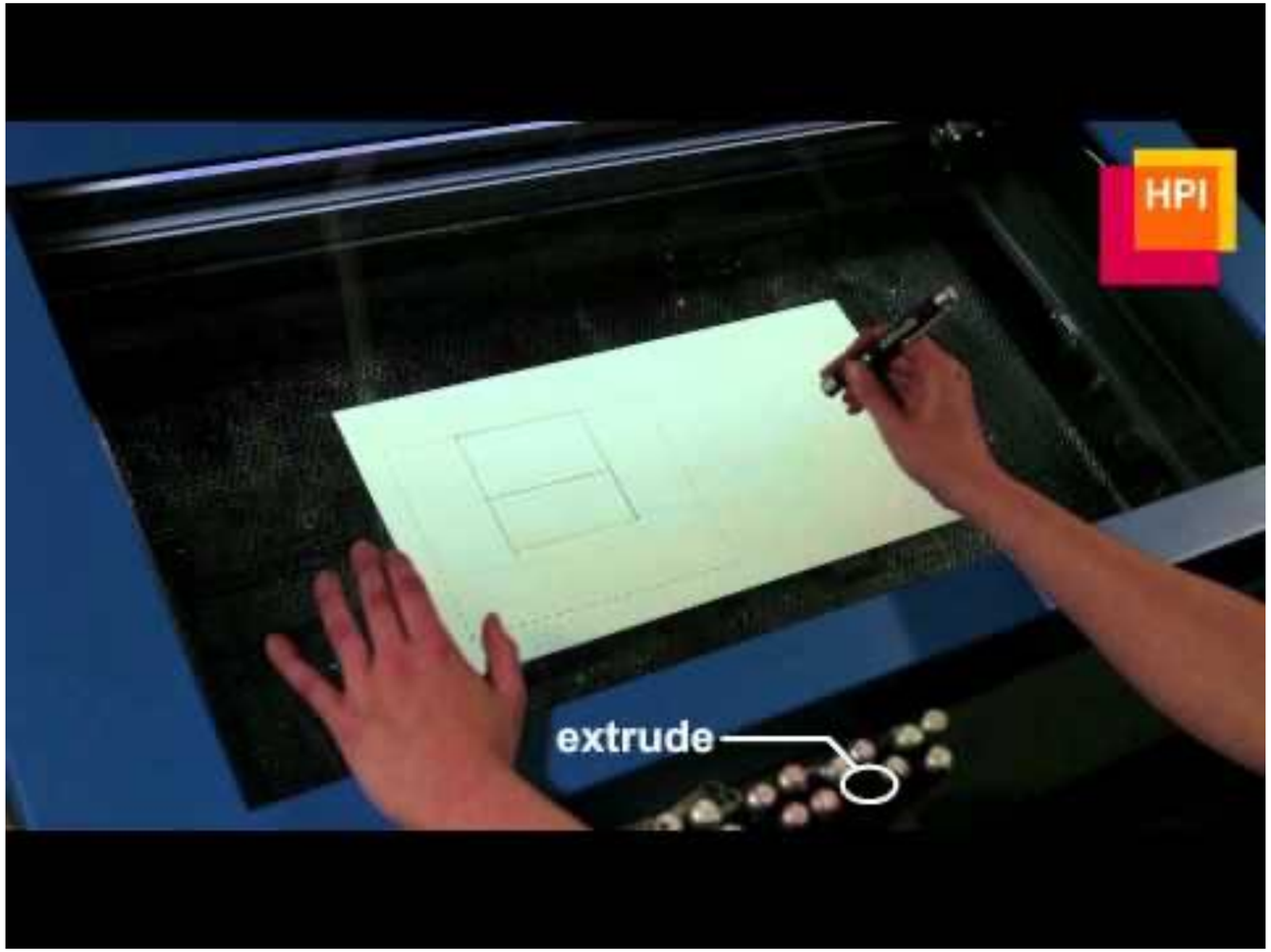
Making no longer requires physical skill (the machine will do it), but just design skill

Dfab workflows are actually more complicated!



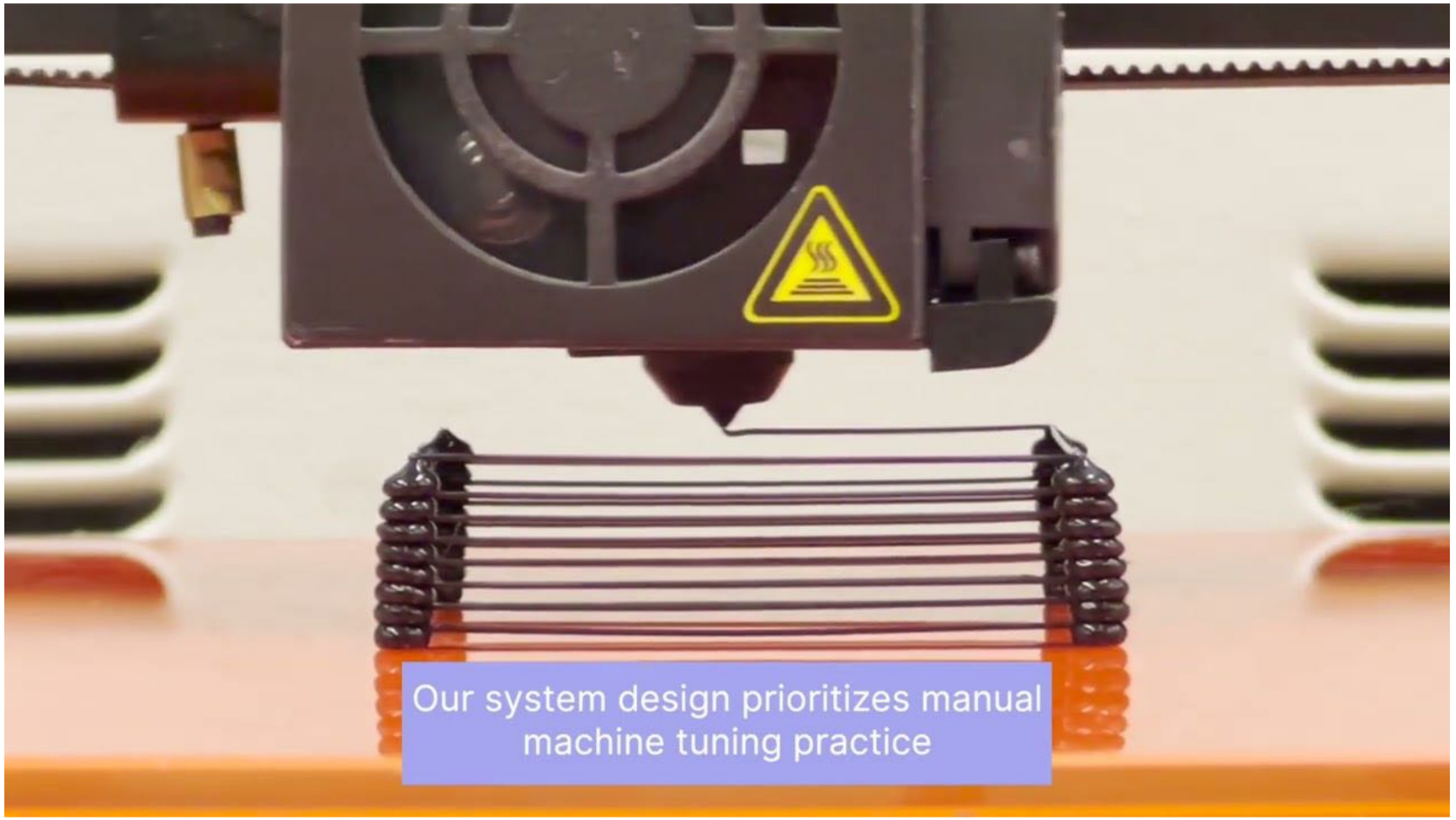
Twigg-Smith et al. Tools, Tricks, and Hacks: Exploring Novel Digital Fabrication Workflows on #PlotterTwitter. 2021

Feedback & interactivity



Mueller et al. Constructable: interactive laser cutting. 2012.

Machine knowledge

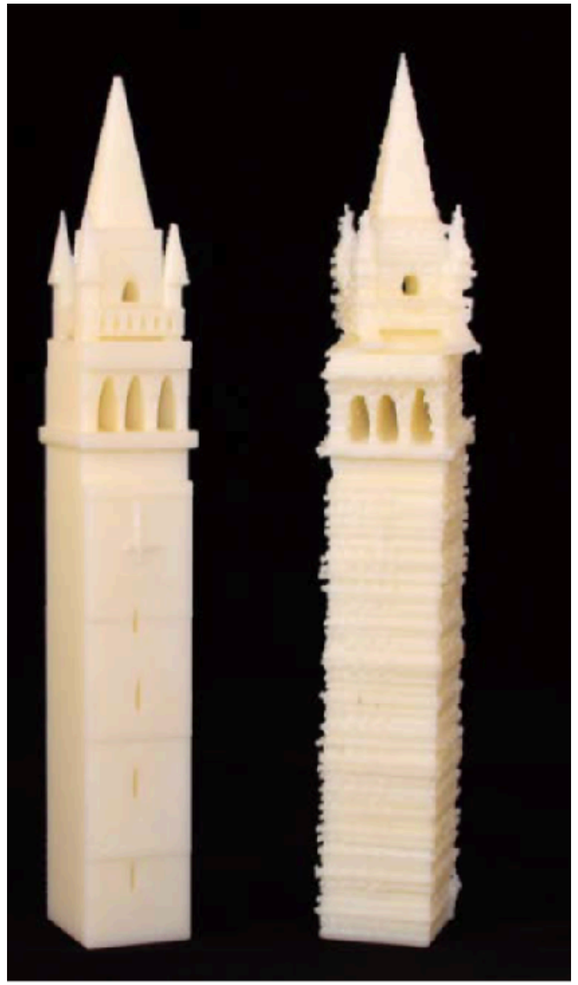


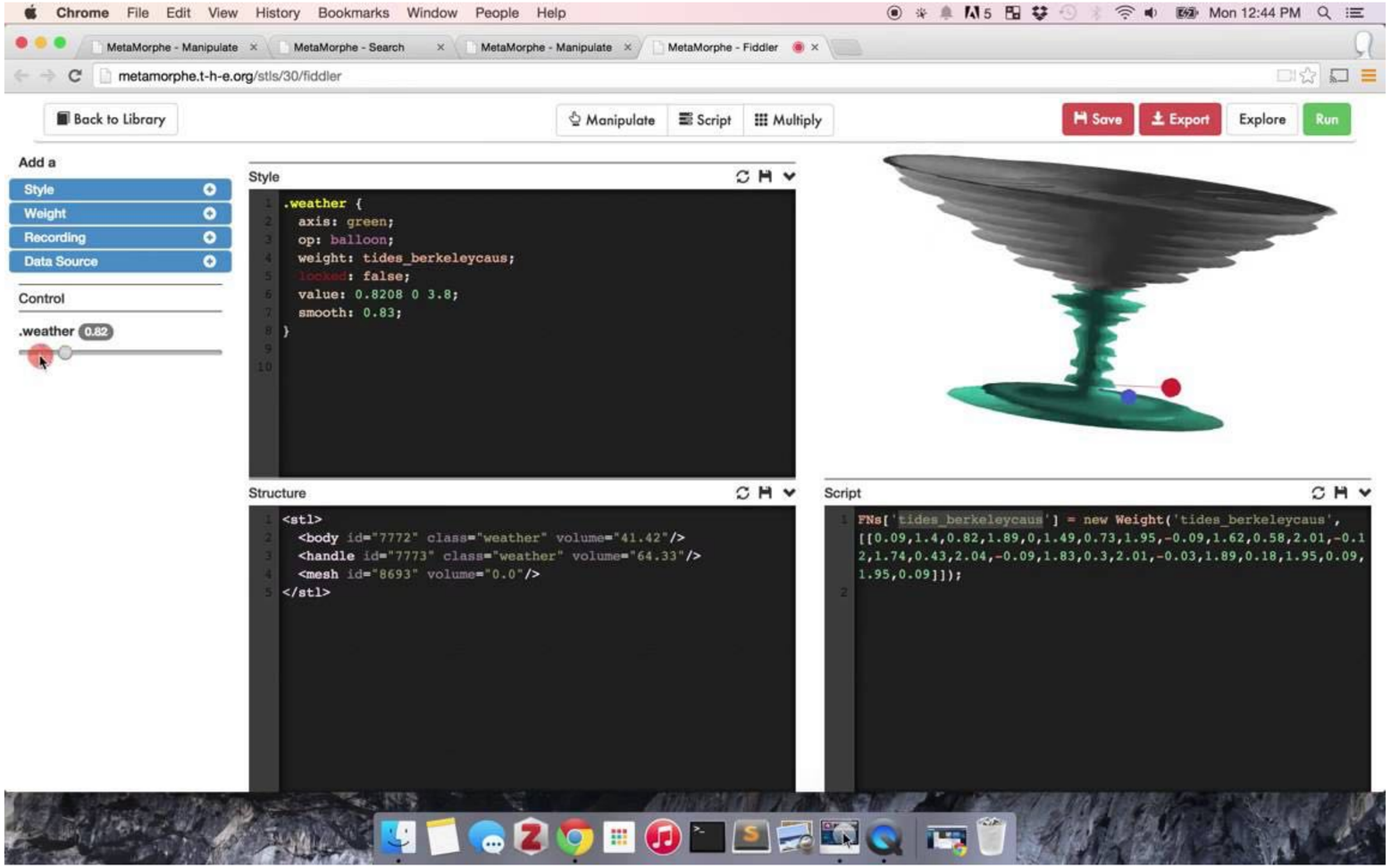
Subbaraman et al. p5.fab: Direct control of digital fabrication machines from a creative coding environment. 2022.

Sustainability

Teibrich et al. Patching physical objects. 2015

Expressivity





Torres et al. MetaMorphe: Designing Expressive 3D Models for Digital Fabrication. 2015

(Physical) design tool strategies

- Make new materials workable (light, air)
- Work based off of your existing domain knowledge or expertise (what are problems you're encountering?)
- Work to make the machines (tools) themselves better or more controllable
- Work to make making more sustainable
- Work to allow users to more easily be expressive in otherwise rigid computational forms
- Next class, we'll talk about digital design tool strategies

Class 10 recap

- Exit ticket: http://tiny.cc/cs181dt-week5
- TODOs:
  - Tues
    - 3 papers, **1 sketchnote**
      - **Watch the videos** (on the website) before reading the paper!
      - For each of the 3 tools, sketch a section on:
        - 1) the problem the tool solves
        - 2) how users interact with the tool
        - 3) one reflection point of what you would add or change
    - Seminar by Kayleah, Rohan
    - Zipcrit by Kayleah

Module 1 questions

How worthwhile were each of the making components of this module? *

Worthwhile can mean: you learned from this component, you enjoyed this component, the effort you put into the assignment was commensurate with what you got out of the experience

	Not worthwhile at all	Meh worthwhile	Moderately worthwhile	Nicely worthwhile	Extremely worthwhile
Making/ hacking culture (PM1)	○	○	○	○	○
Design fiction/ disobdient objects (P1)	○	○	○	○	○
Foamcore (in class)	○	○	○	○	○
Cardboard (PM2)	○	○	○	○	○
Laser cutting (PM3)	○	○	○	○	○
Creative coding (in class)	○	○	○	○	○

For next year, should another constraint of P1 be that it has to use some kind of computation? *

E.g., the object needs to be digitally fabricated, there should be code written for the object

I struggled with the tension of having students focus on making a disobedient object/an object that comments on culture (which was the learning goal) versus having more "computational" aspects since the course title is, indeed, "computational design tools"

- ○ Yes
- ○ No
- ○ Other: _____