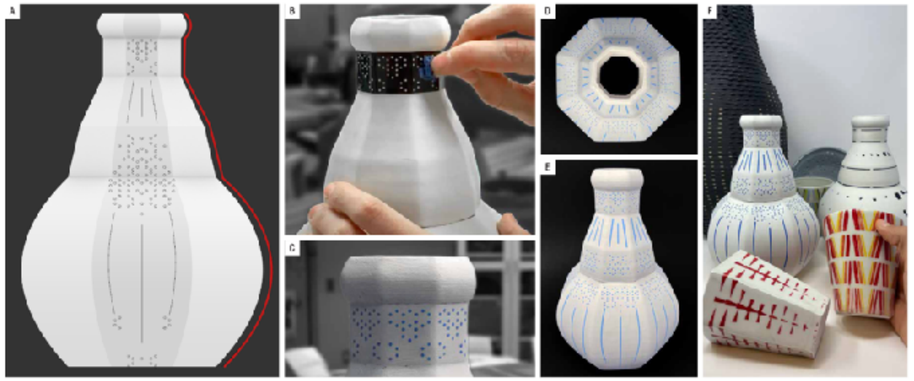
CS181DT Class 8: Design tools for DFAB

Polagons by Sethapakdi et al. (CHI 2023)

Aesthetic Electronics by Lo et al. (UIST 2016)



CeramWrap by Toka et al. (UIST 2023)

Class 8 agenda

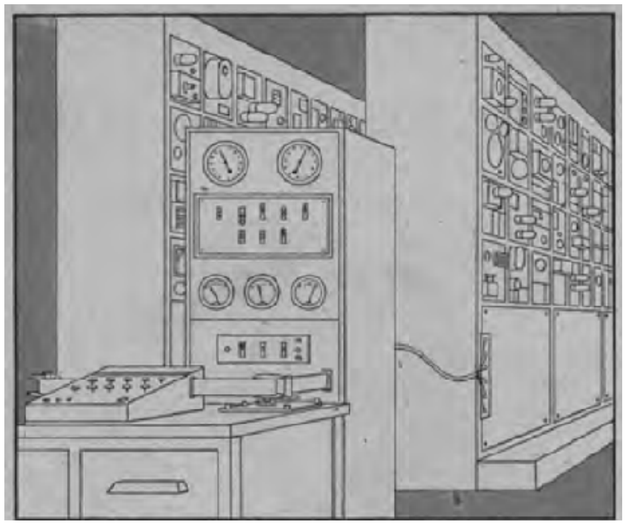
- ZC x 2
- Lecture: a very brief history of HCI research + Design tools for digital fabrication
- Break
- Seminar: digital fabrication research

A very, very brief introductory history of HCI research

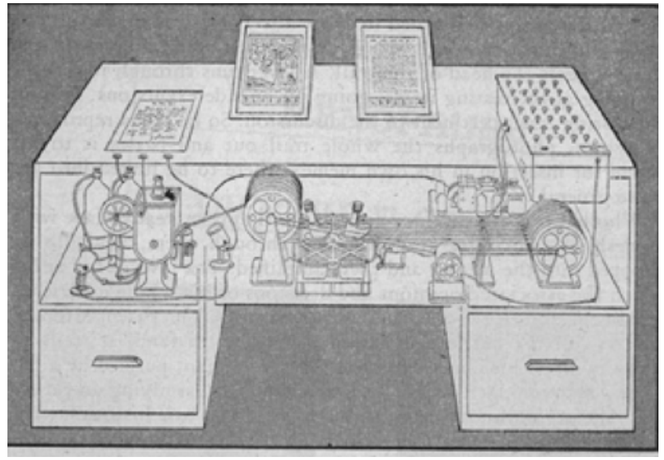
(with slides from Michael Bernstein)

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

Meta smart glasses



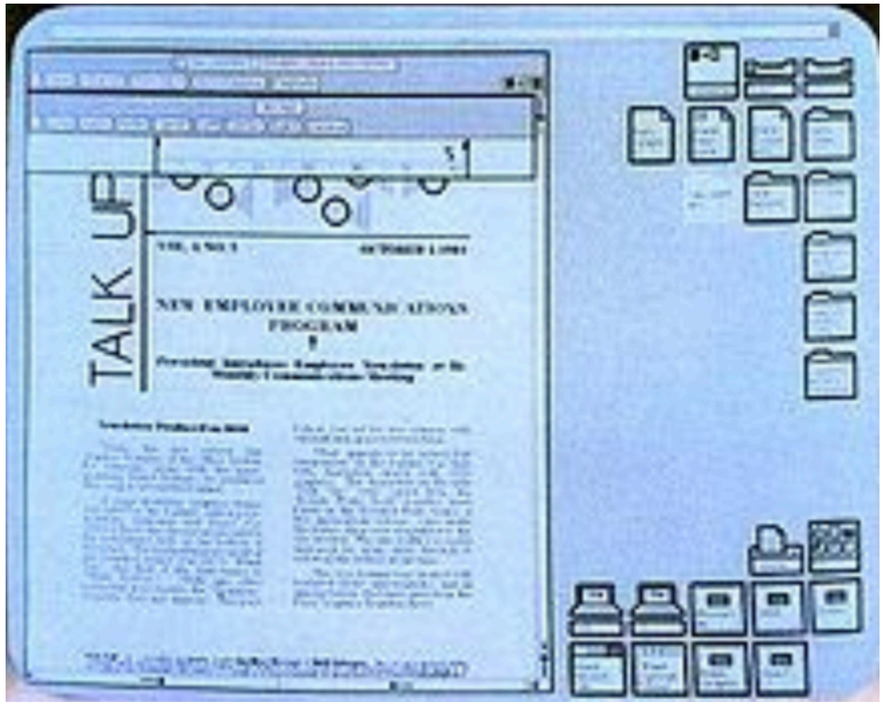
Thinking machines



Memex desk

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

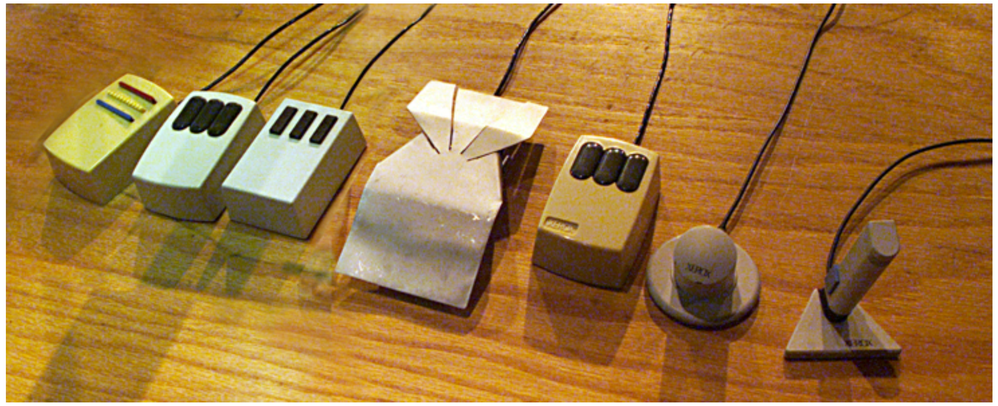
Right after WWII, created lots of funding for CS



The Xerox Alto

Xerox PARC, 1973

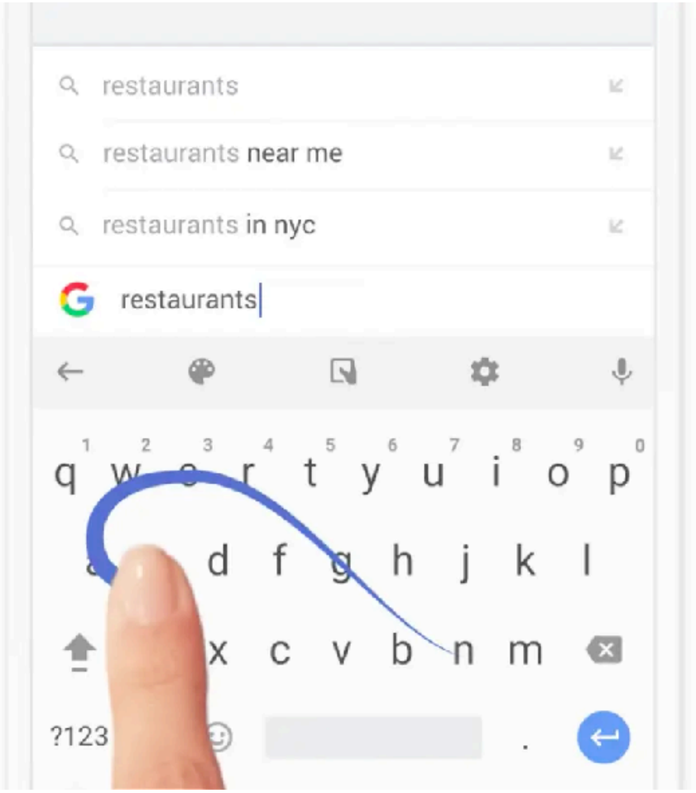
Modern MacOS



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

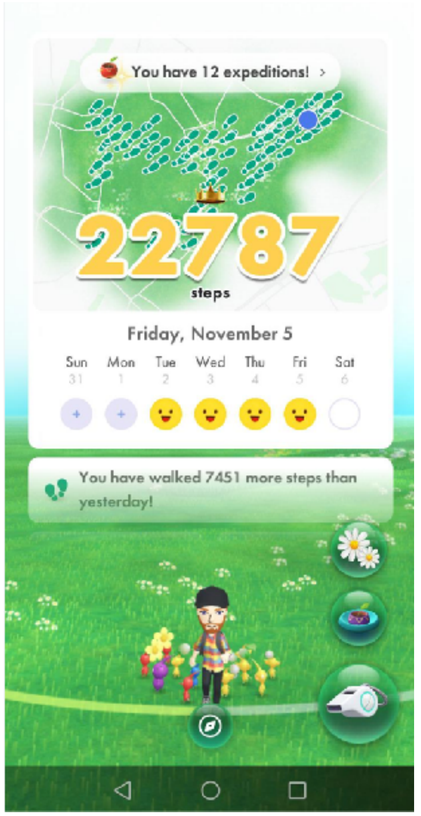


Swipe text keyboards

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

QR codes

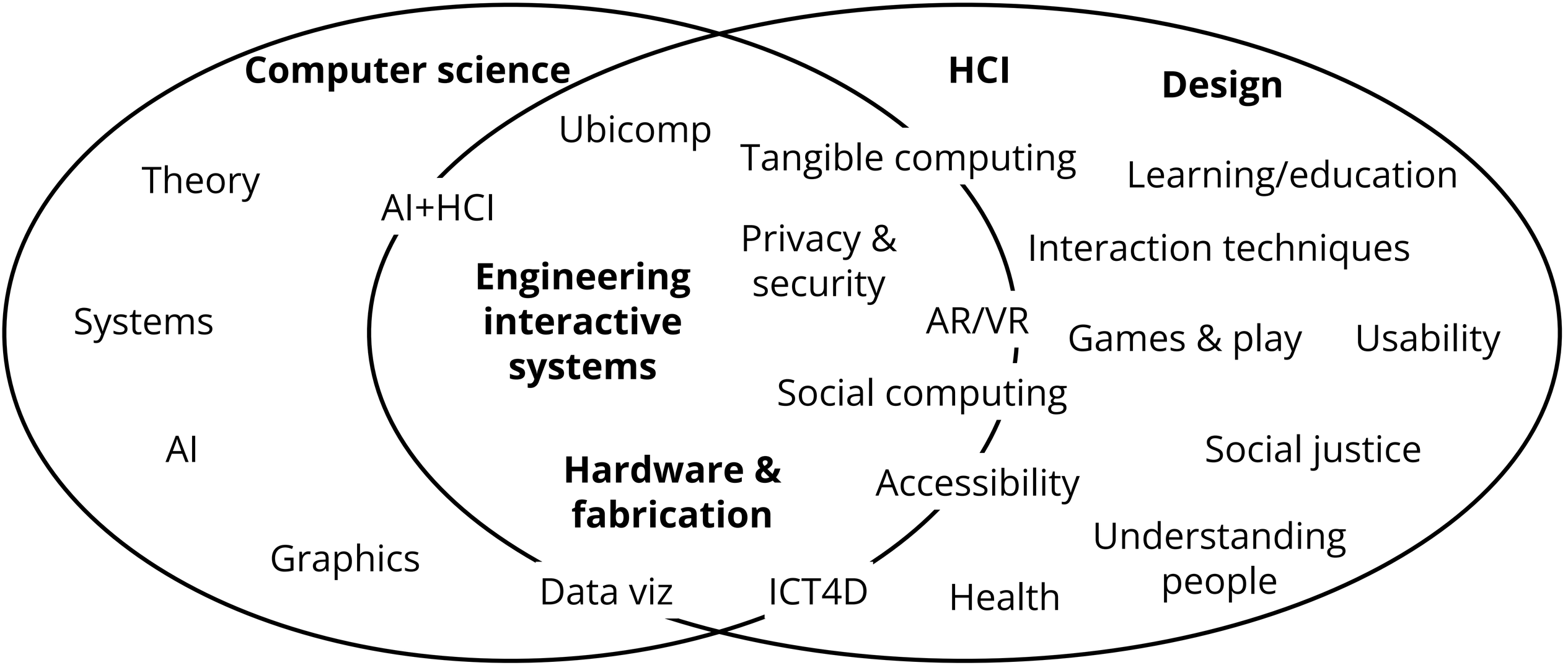
Consolvo et al. *Activity sensing in the wild: a field trial of UbiFit Garden*. 2008



Modern fitness trackers

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

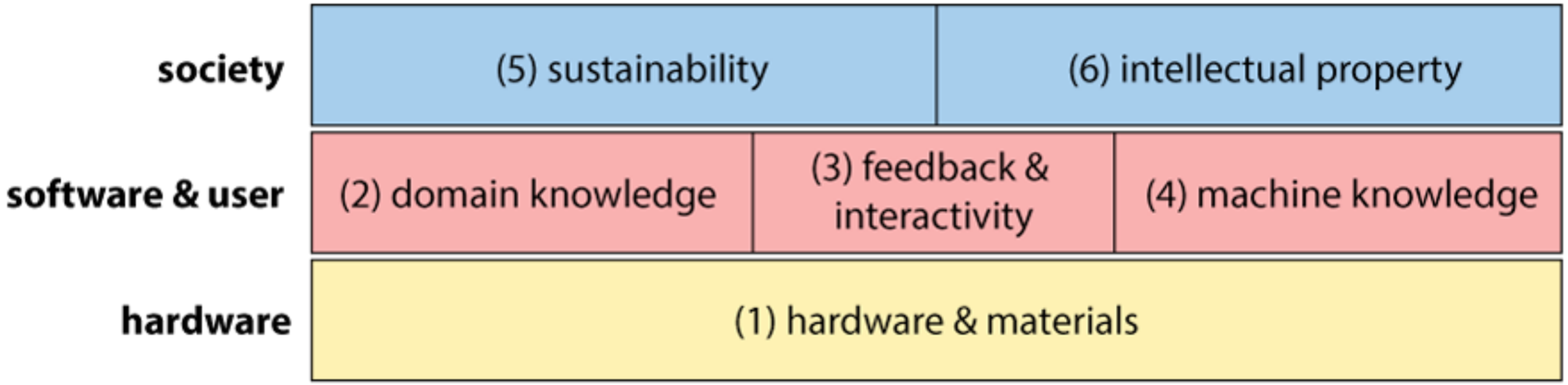
Research areas of HCI



Design tools for digital fabrication

Digital fabrication -> Personal fabrication

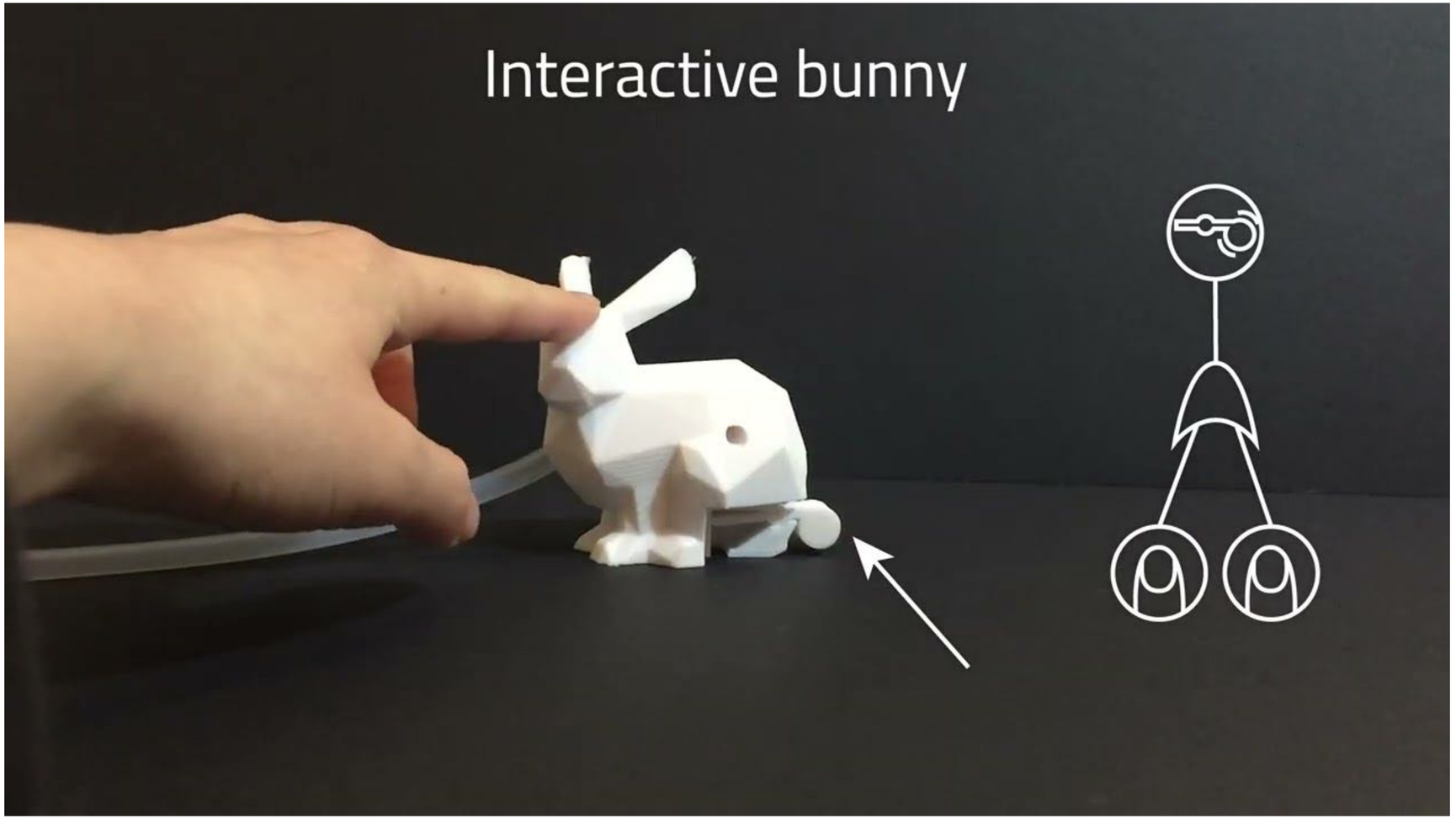
- While there are huge machine fabrication factories and supply chains, most HCI research on digital fabrication focuses on *personal fabrication* at the consumer/hobbyist level
- Most researchers are consumers/hobbyists themselves, the machines are more accessible to labs, and it's much easier to design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



Hardware & materials

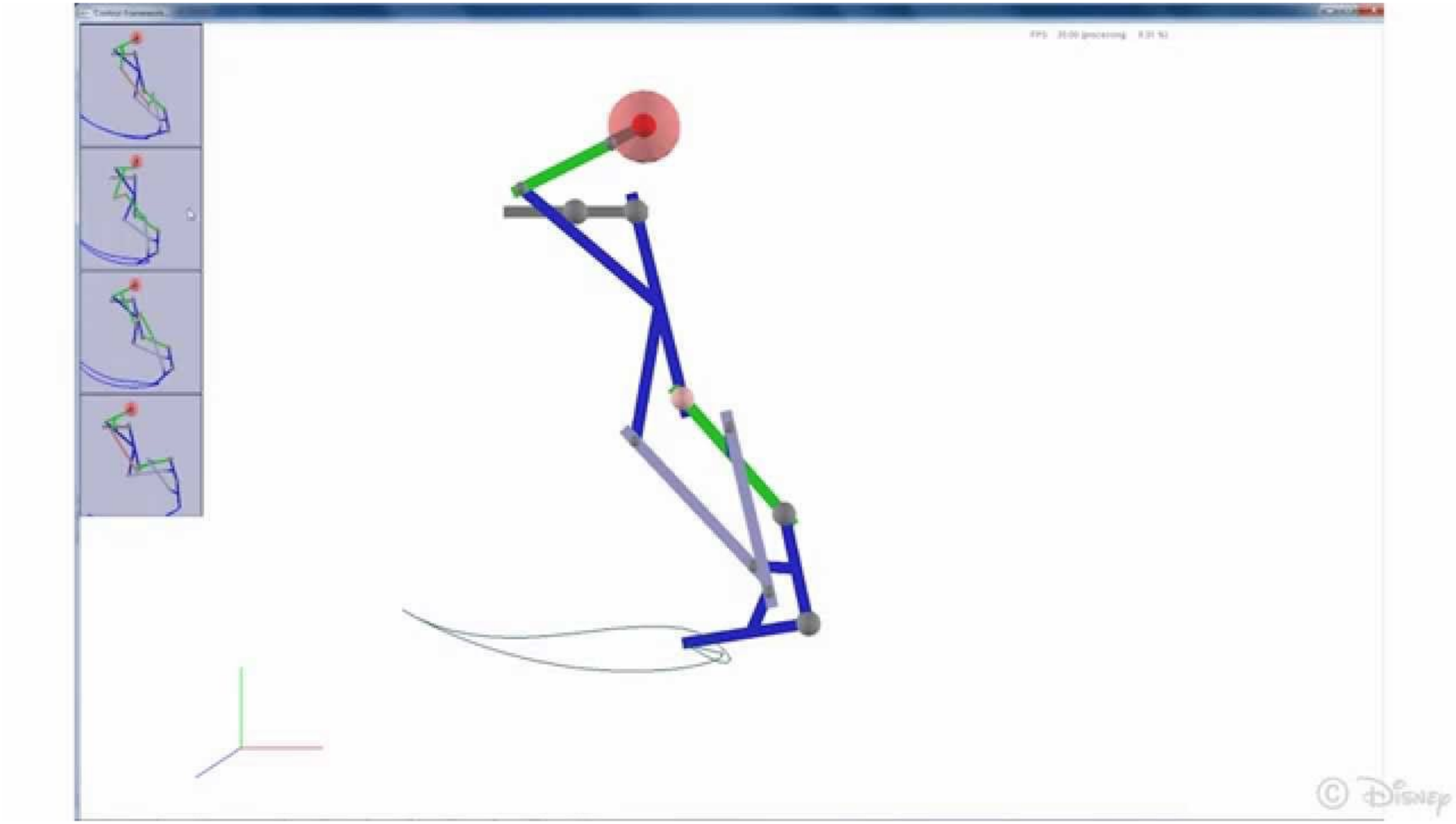
Willis et al. Printed Optics. 2012

Hardware & materials



Savage et al. AirLogic. 2022

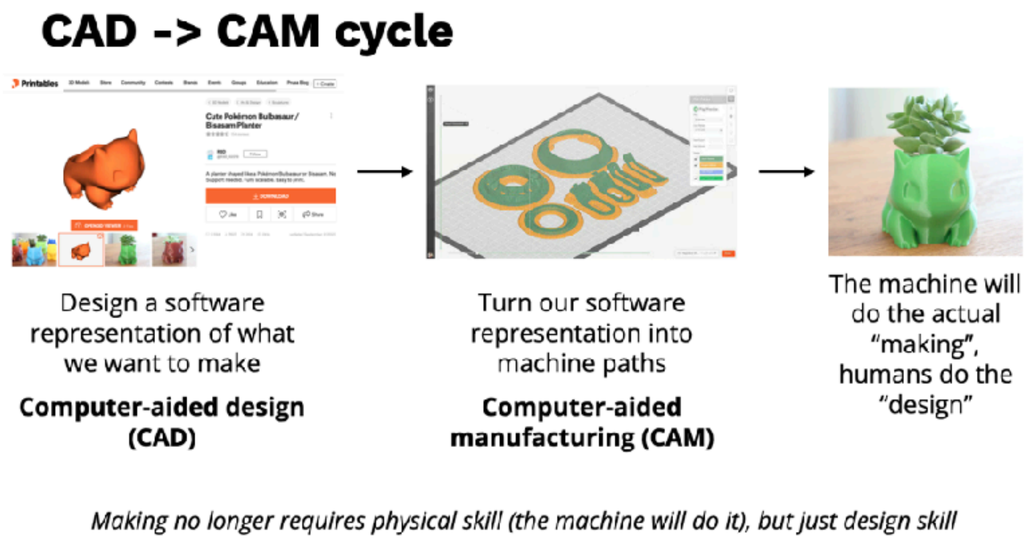
Domain Knowledge (kinematics)



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

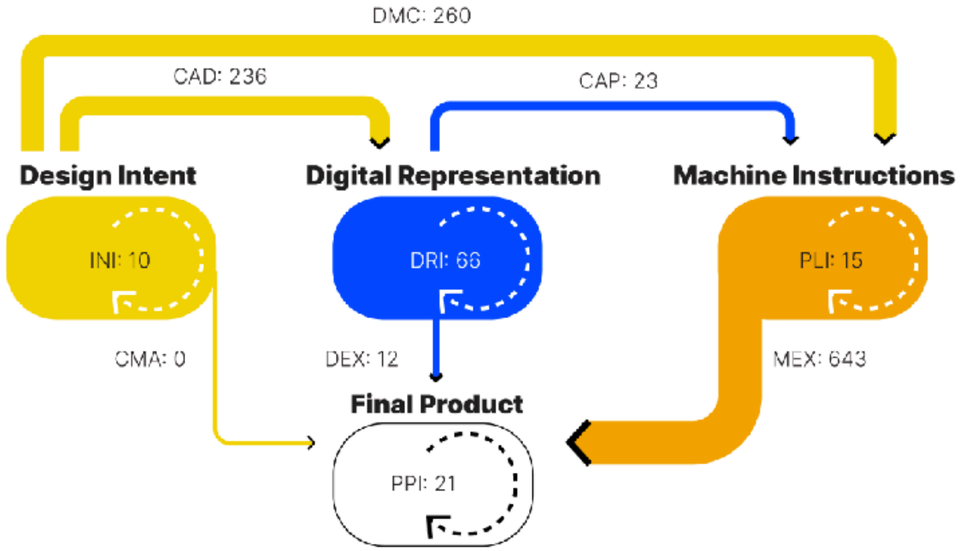
Domain Knowledge (understanding communities)

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



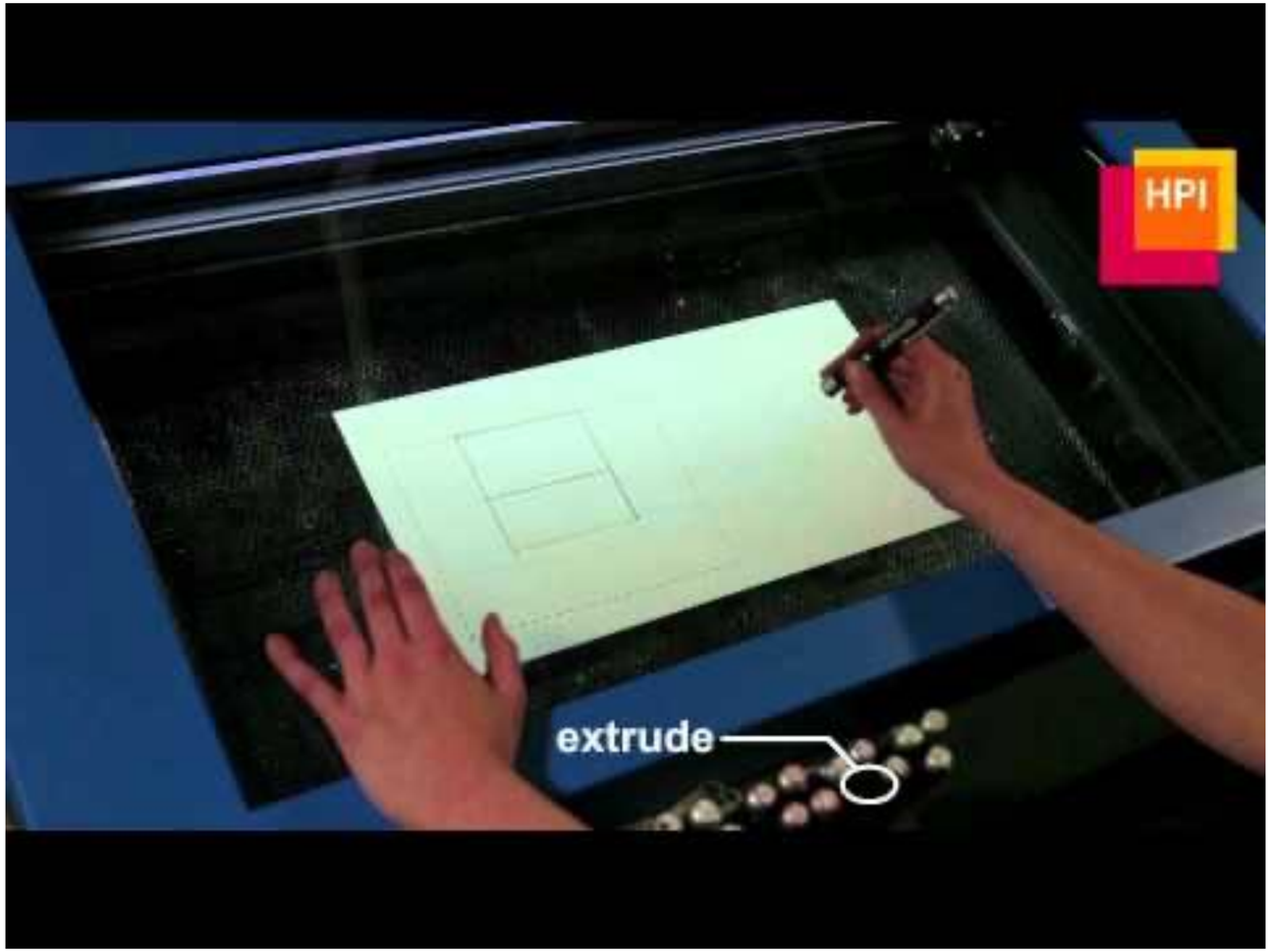
Making no longer requires physical skill (the machine will do it), but just design skill

Dfab workflows are actually more complicated!



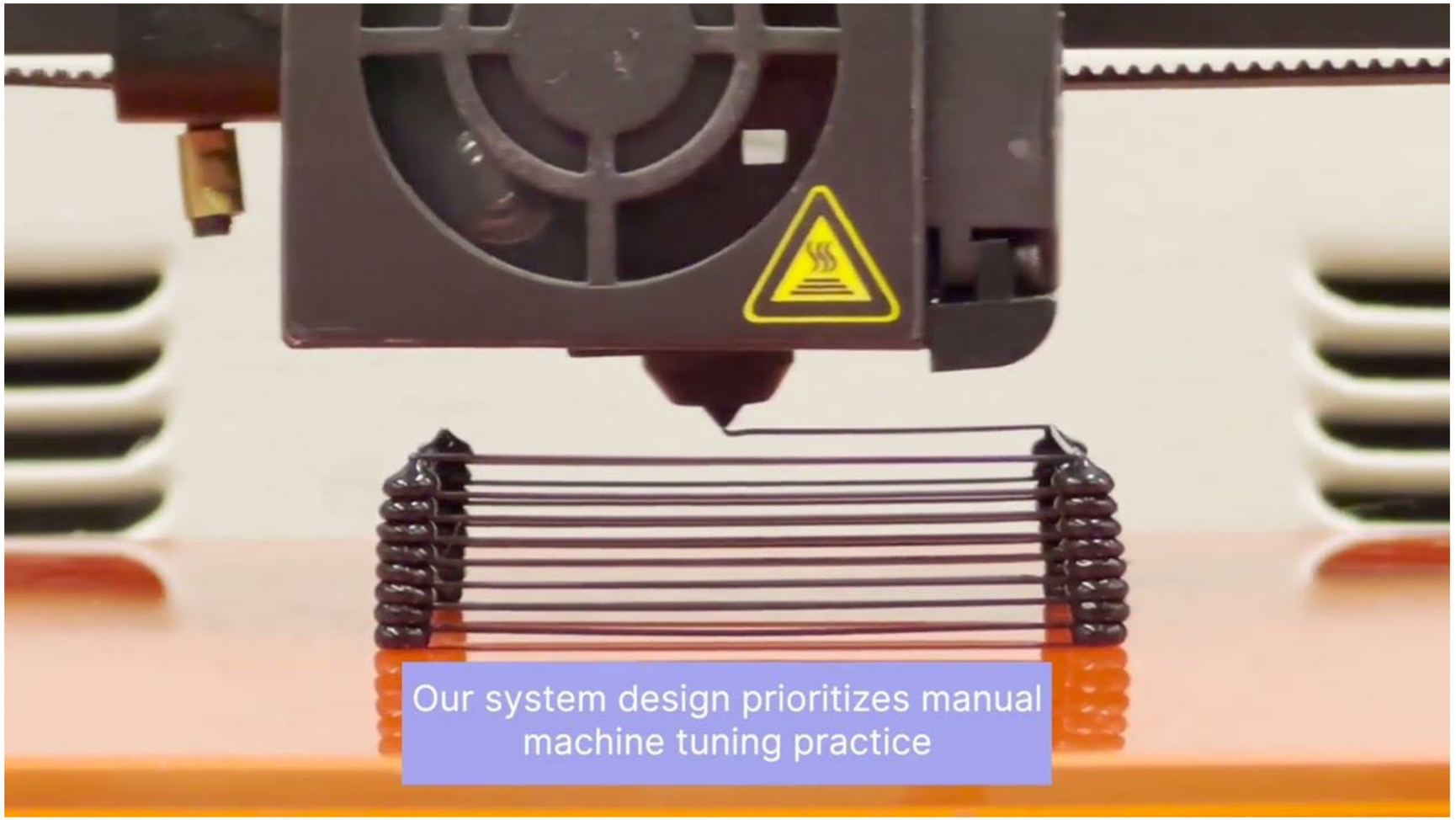
Twigg-Smith et al. Tools, Tricks, and Hacks: Exploring Novel Digital Fabrication Workflows on #PlotterTwitter. 2021

Feedback & interactivity



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

Machine knowledge

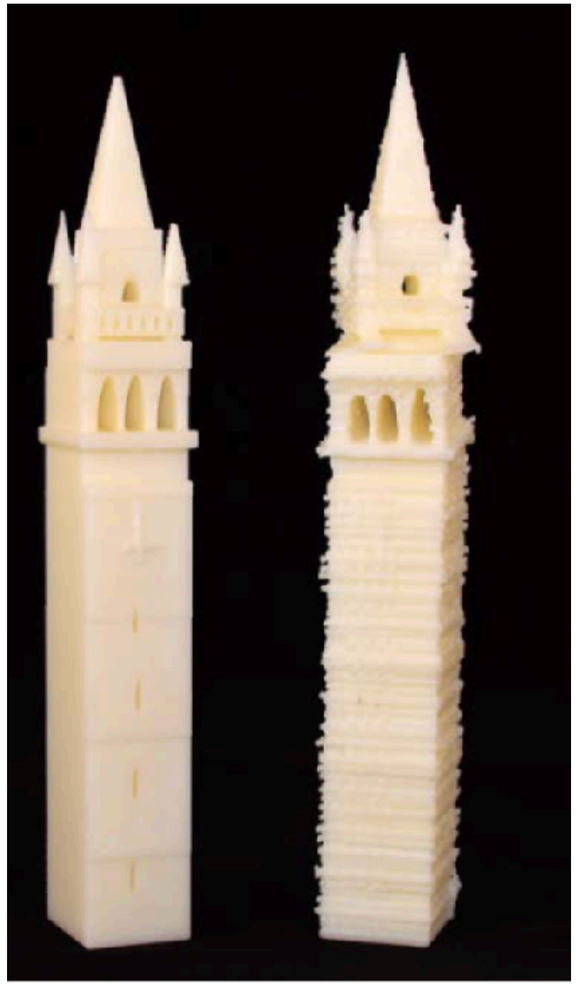


Subbaraman et al. p5.fab: Direct control of digital fabrication machines from a creative coding environment. 2022.

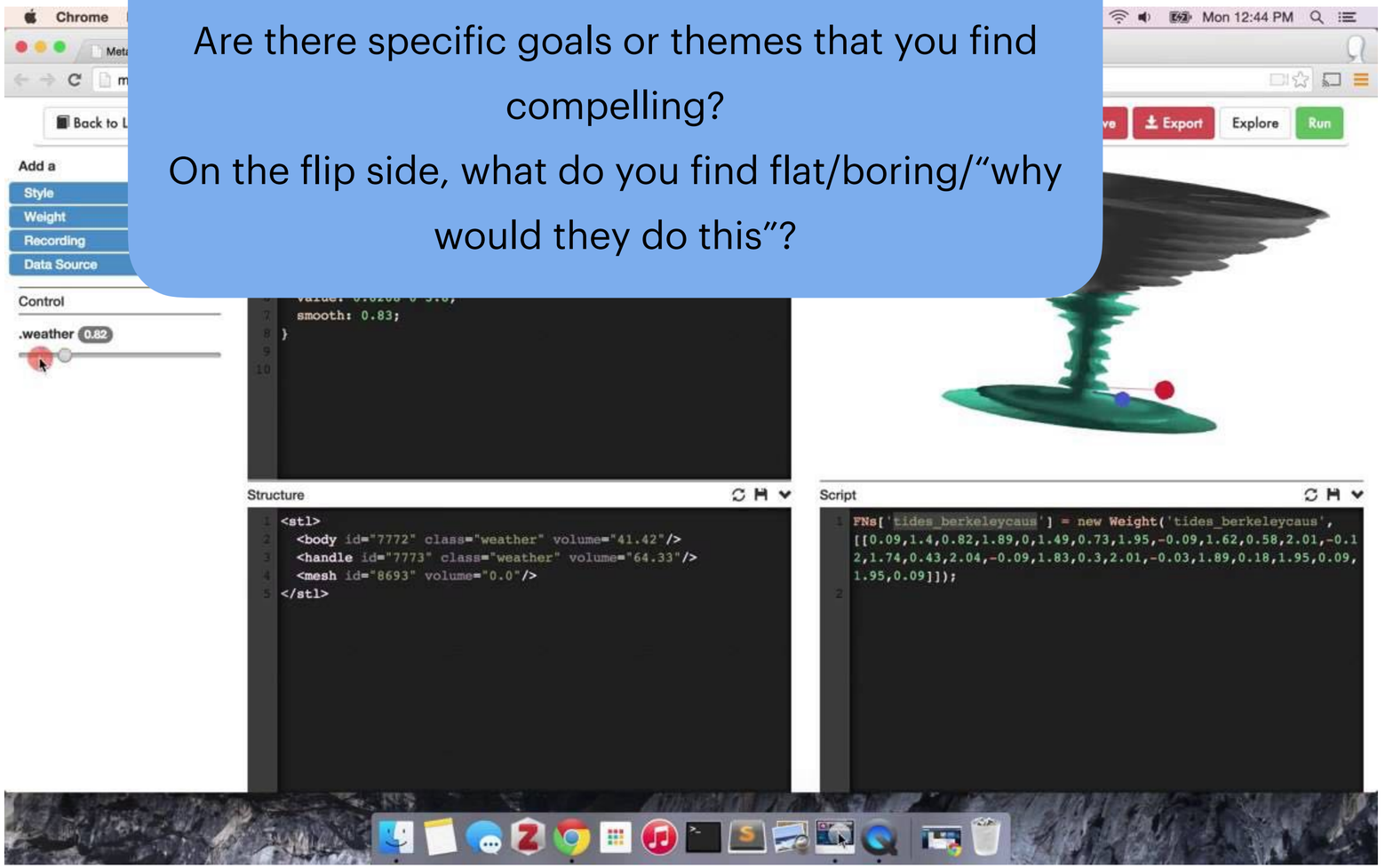
Sustainability

Teibrich et al. Patching physical objects. 2015

Expressivity



Now that you've seen many examples of DFAB research projects, what sticks out to you?
Are there specific goals or themes that you find compelling?
On the flip side, what do you find flat/boring/"why would they do this"?



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
- In the Creativity Support Tools (CSTs) class, we’ll talk about digital design tool strategies

Break/Seminar

Class 10 recap

- Todos:
  - By next **Monday**:
    - Press Fit Kit (PM3)
  - By next **Wednesday**:
    - CST RRs + seminar
- **Announcements**
  - Please come to mentor hours to get project help! Abrar's are going to be in the HMC maker space this **Friday** (1:15-3:15pm) and vote on Slack for Ariel's times this **Sunday**
  - **Scaling** is challenging as Figma doesn't have units = my suggestion, treat 100 pts = 10 cm, make a 100x100pt box and cut it first and make sure it's 10x10cm