

# Intro: Design and Creation

MICHAEL BERNSTEIN

CS 376

# Designing an effective research topic

# “Location sensing to autoshare shopping habits.”

Could be research if:

- nobody has ever proposed shopping as a problem
- your solution generalizes to other problems and has never been demonstrated
  - e.g., sensing location based on smell
  - e.g., public shaming to change behavior

Probably not research if:

- you are applying a solution that we know about already to a problem that we know about already

# “Designing a mirror to tell me if clothes are in style.”

Could be research if:

- nobody has ever studied how people use technology to avoid fashion faux pas
- your solution generalizes to other problems and has never been demonstrated before (e.g., determining style through FB photos)

Probably not research if:

- you are applying a solution we know about already to a problem that we know about already
  - e.g., this is solely a user-centered design project
  - e.g., you are not contributing a new technique or domain

# “Researching the new hot app SnortChat.”

Could be research if:

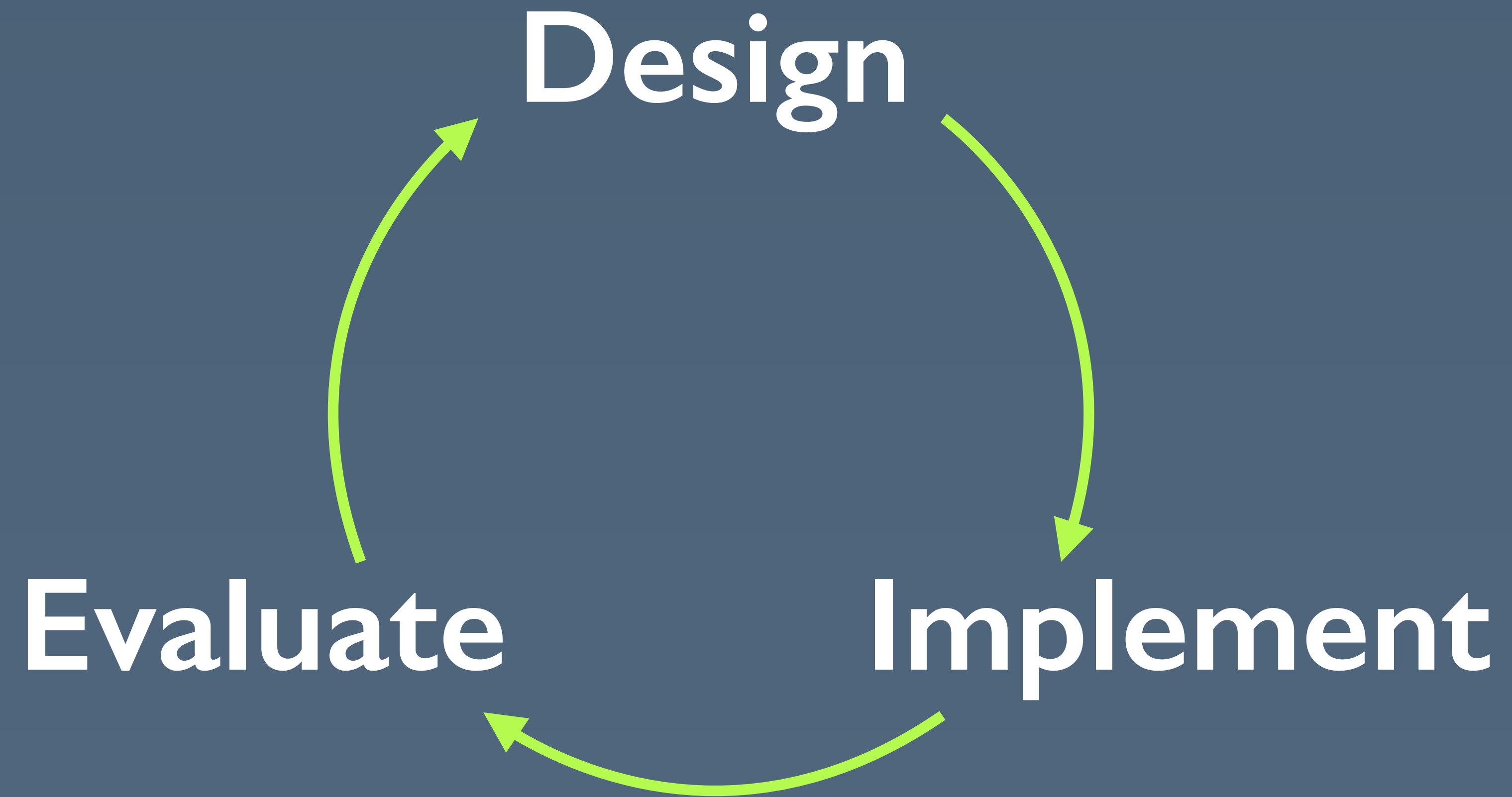
- SnortChat exemplifies an interesting point in the design space, and we use it to understand that axis or design space
- Theories suggest that SnortChat should work one way or should not succeed, but it's the opposite.

Probably not research if:

- you have trouble articulating what broader design choice SnortChat is an example of
- we have studied applications like SnortChat in the past, and SnortChat works the same way
- you have to put the word “researching” in the title

# Intro: Design and Creation

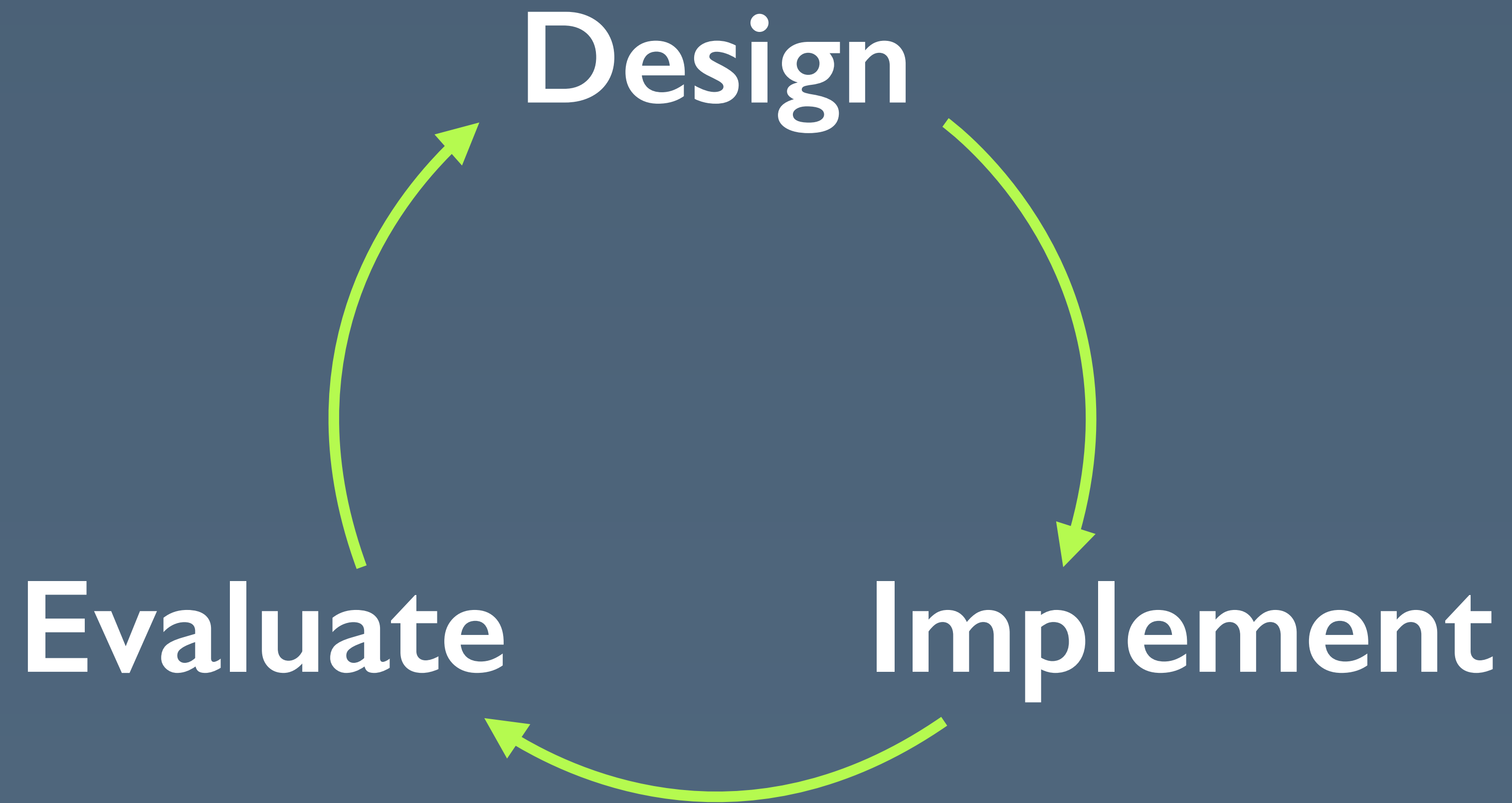
OK, LET'S TRY AGAIN.



**Design and creation are  
not static processes.**

**They can be studied,  
supported and improved.**





**How might we facilitate and empower  
this process?**

# Design

Brainstorming process  
Early-stage design tools

# Evaluate

Study strategies  
Cognitive modeling

# Implement

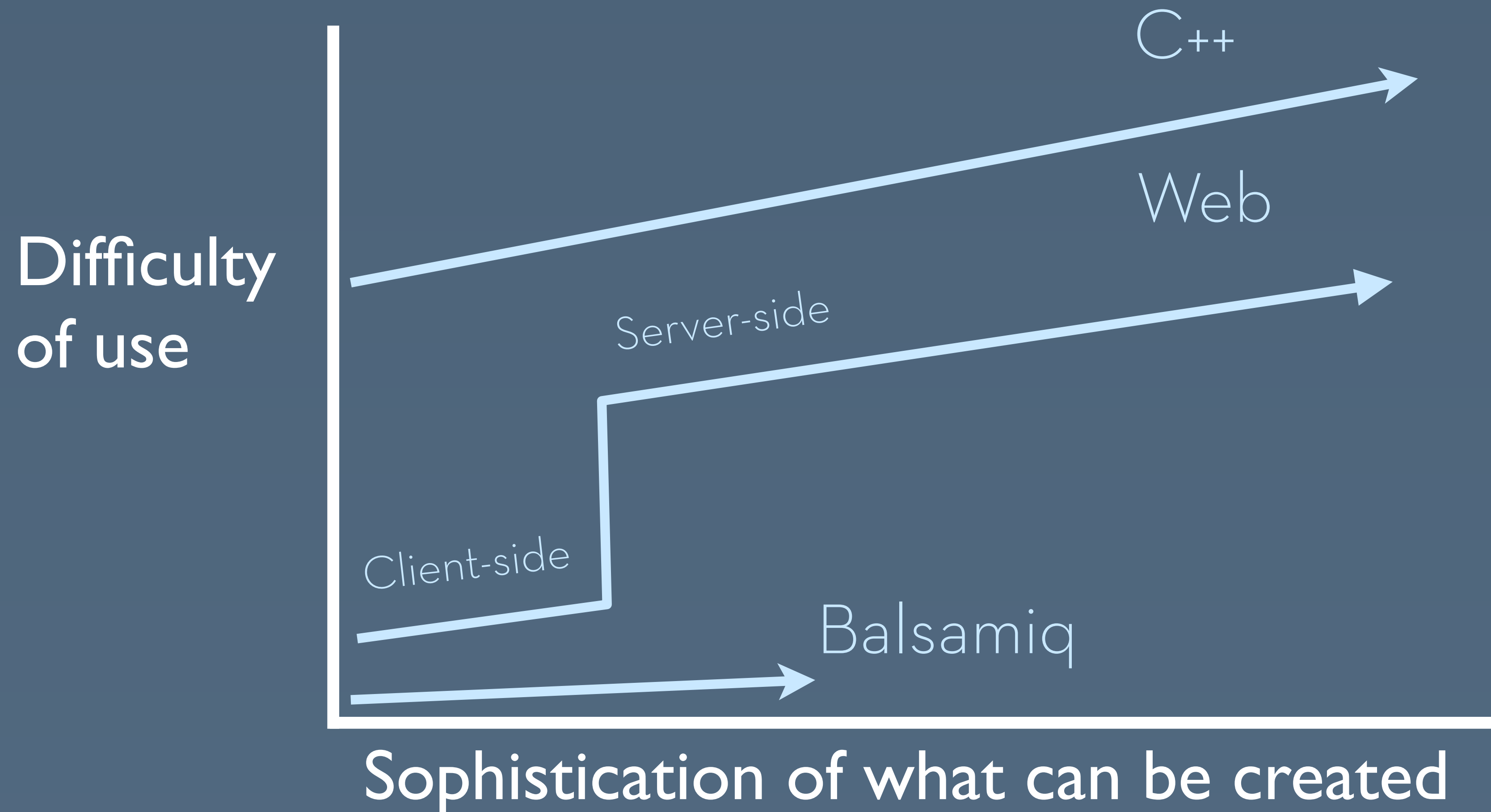
Programming tools  
WYSIWYG design tools  
Rapid prototyping tools

**“Enlightened trial and error  
outperforms the planning of  
flawless intellect.”**

- David Kelley

# Threshold/Ceiling Tradeoff

[Myers, Hudson and Pausch, TOCHI 2000]



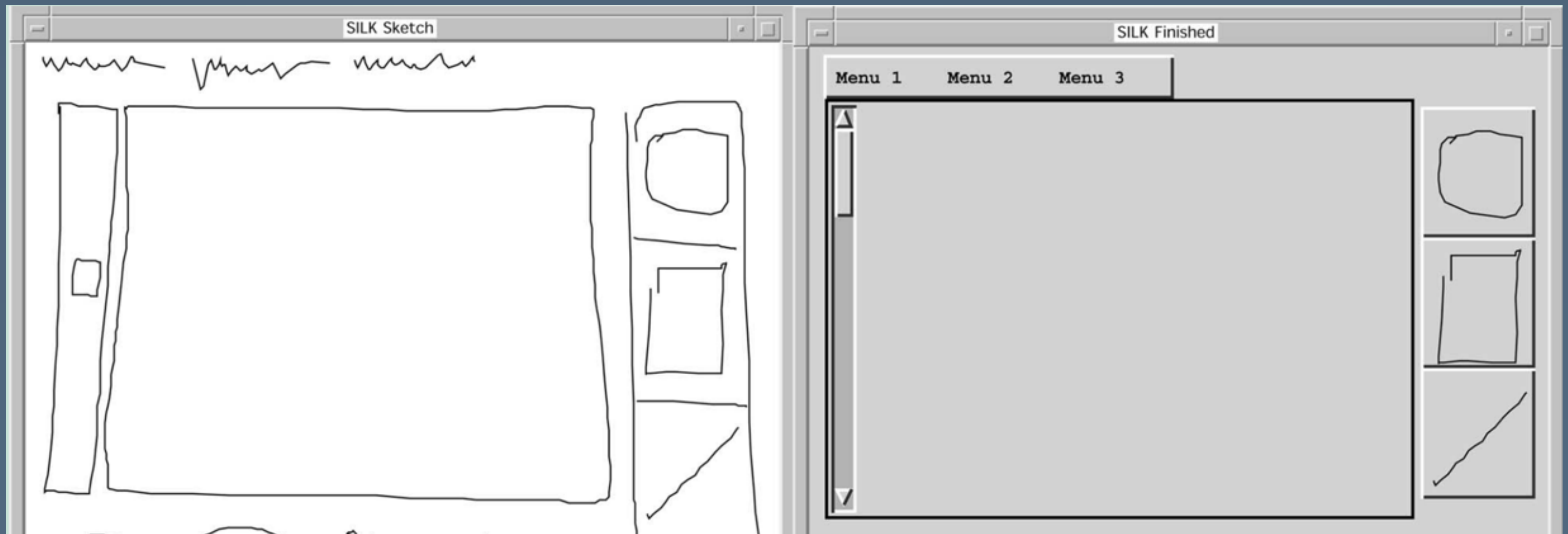
# Design tools

# Goal: facilitate rapid iteration

- Prototypes enable exploration and iteration around concrete artifacts
- The more fluid the prototyping process is, the more you can learn before you sink time into engineering

# Sketch the interaction to produce working systems

- SILK [Landay, CHI '96]



# Sketch the interaction to produce working systems

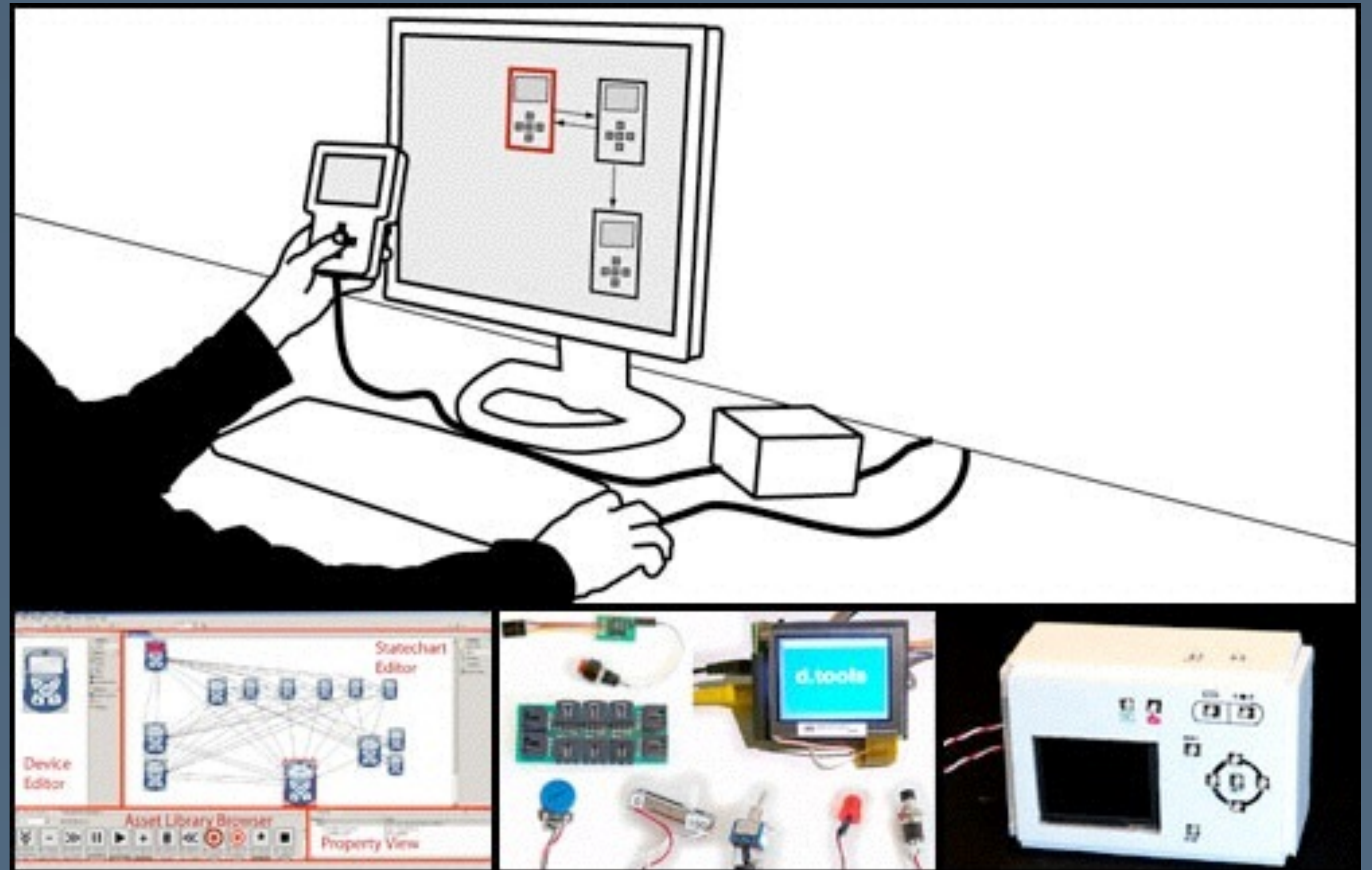
- Led to: Balsamiq





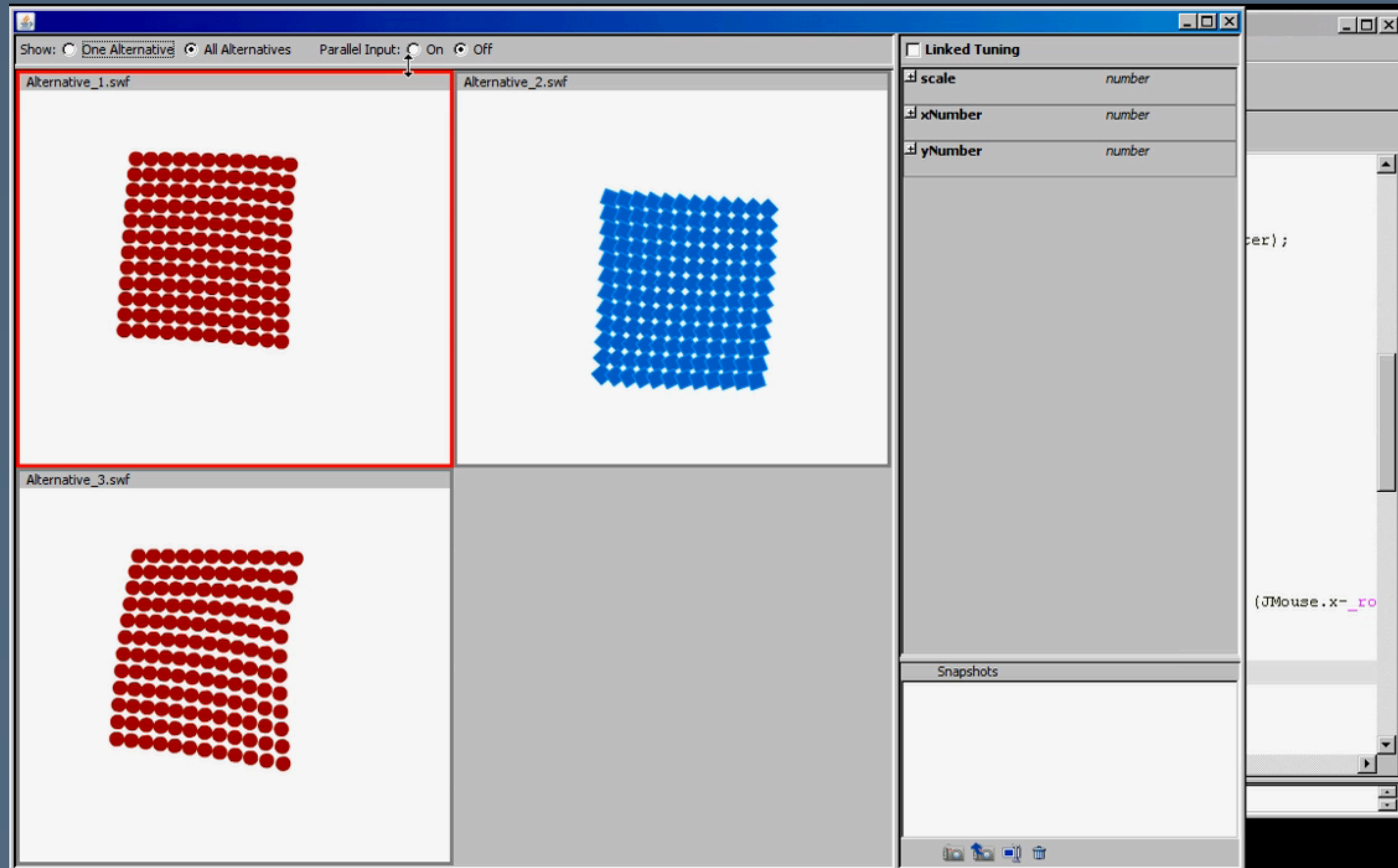
# d.tools: Prototyping Physical Computing Experiences

- How might we prototype an iPhone in thirty minutes?
  - Plug-and-play sensors
  - Statechart authoring for logic
  - Runtime visualization of user states



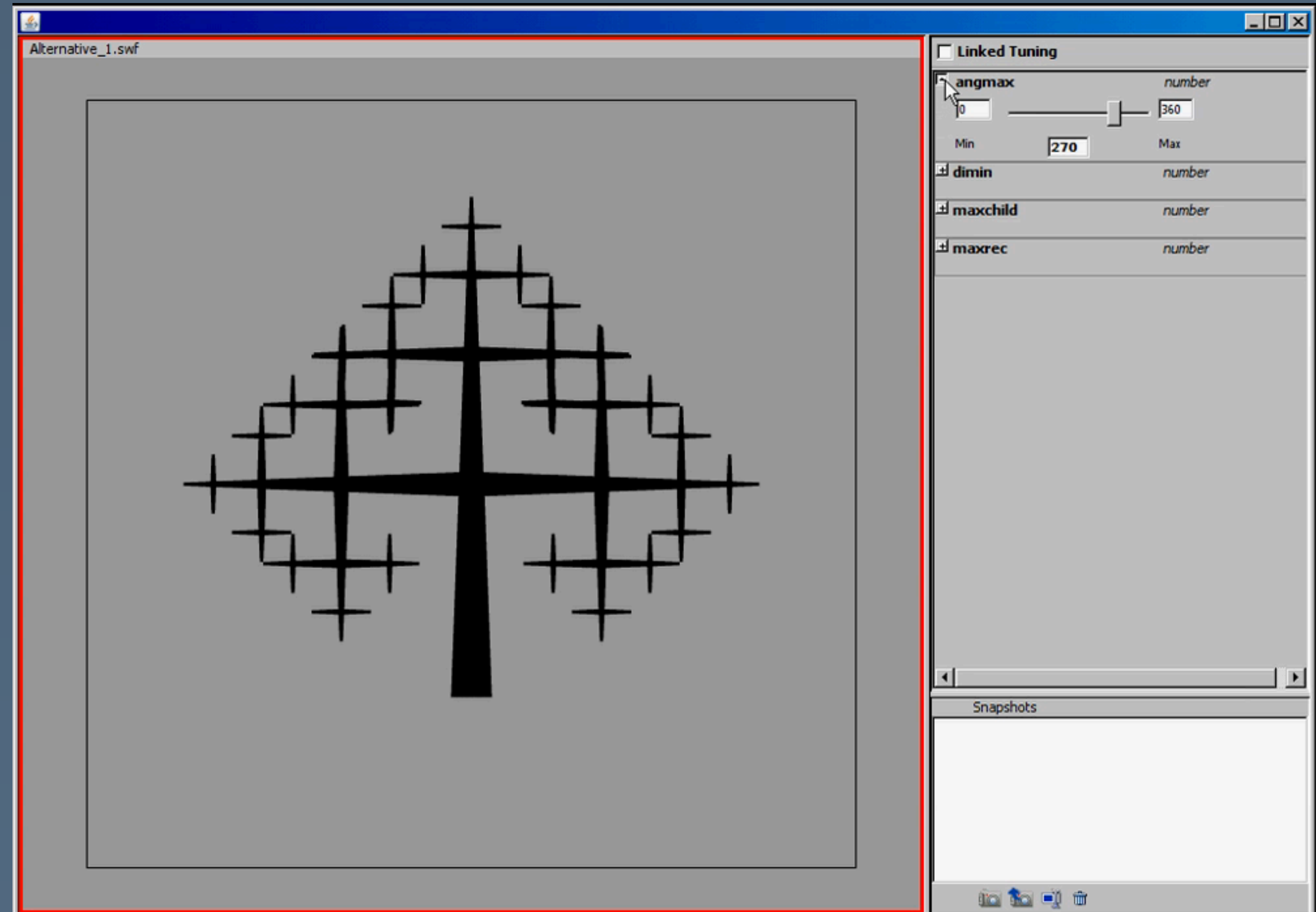
# Closed-loop parameter tuning

- Juxtapose  
[Hartmann et al.,  
UIST 2009]



# Closed-loop parameter tuning

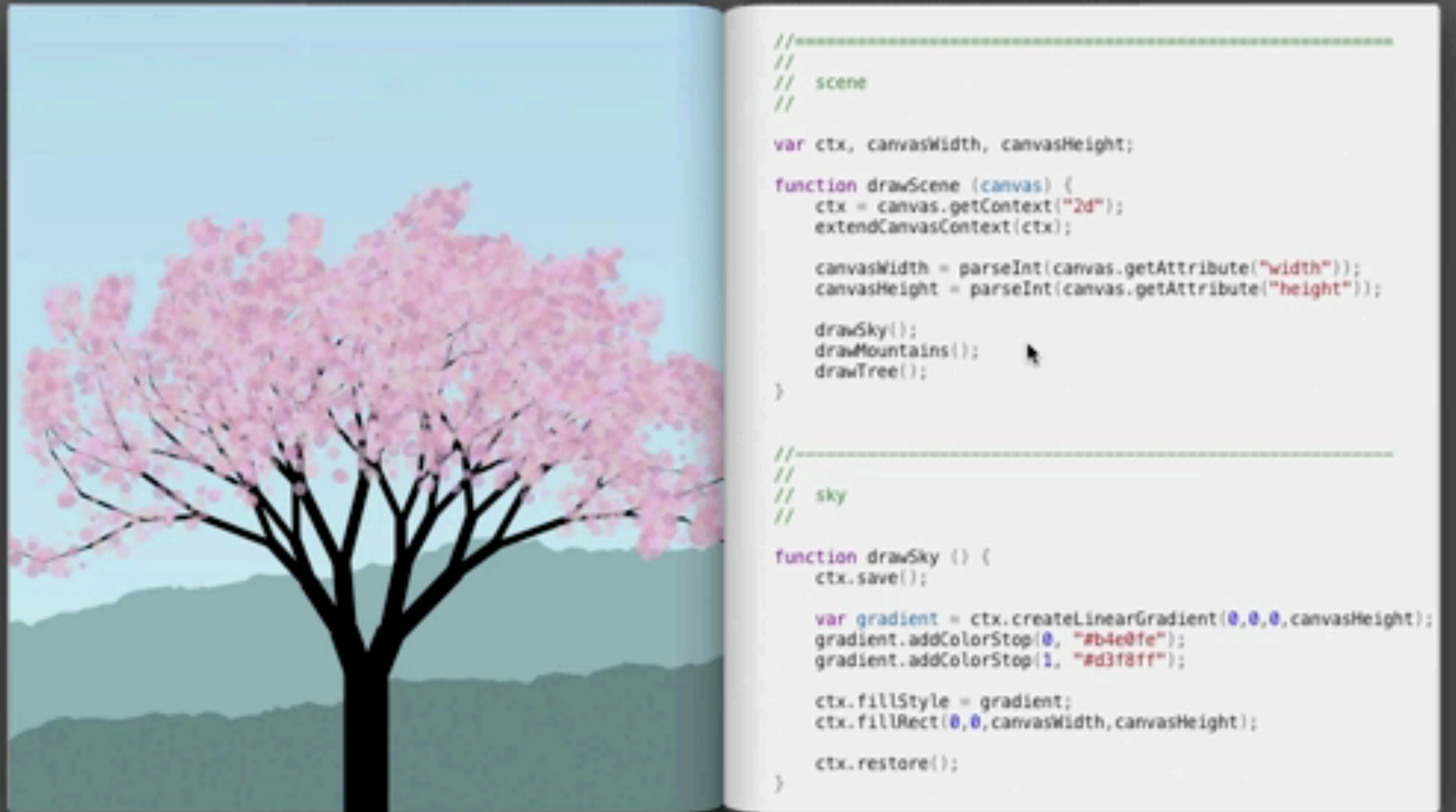
- Juxtapose  
[Hartmann et al.,  
UIST 2009]



Tree matc

# Closed-loop parameter tuning

- Led to:  
Inventing on  
Principle  
[Victor 2012]



# Design process

# Improve the process, improve the output.

- The design process we teach in human-computer interaction need not be fixed!
- Many techniques we use today were once prototyped in research labs.

# Wizard-of-Oz Prototypes

- An iterative design methodology for user-friendly natural language office information applications [Kelley, TOIS '84]
- *“Central to the methodology is an experimental simulation which I call the OZ paradigm, in which experimental participants are given the impression that they are interacting with a program that understands English as well as another human would.”*

# Iterate on a design, or create parallel alternatives?

[Dow et al., TOCHI 2010]

- Feedback on five iterations or five parallel alternatives
- Quality measured via ad clickthrough
- Designs generated in parallel condition had ~1/3 more clicks
- More soon...





# Participatory Design

[Schuler and Namioka '93]

- Developed in Scandinavia, and later ported to the United States design tradition
- Involve the eventual users deeply in the design process
  - Initial exploration
  - Problem definition
  - Develop and focus ideas
  - Evaluation

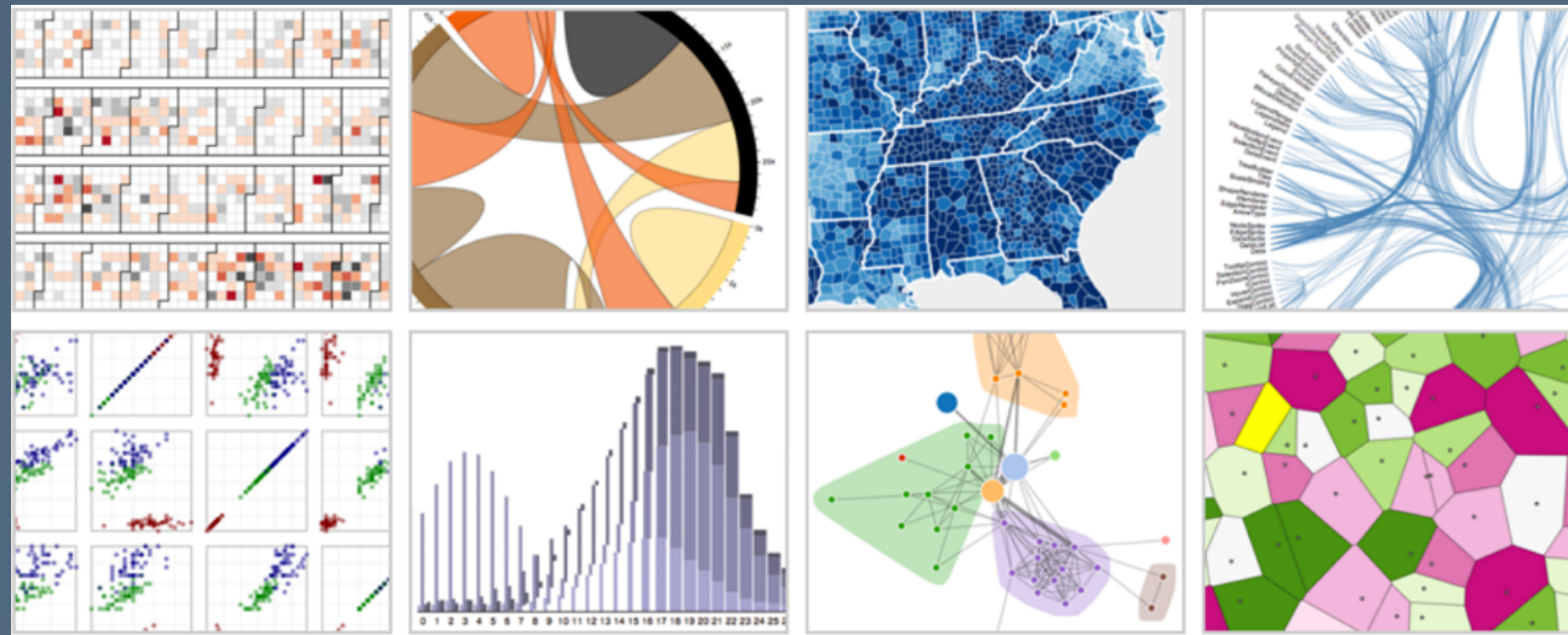
**(End-user)  
programming**

# Garbage in, garbage out

- The quality of the interactive systems we build depends on the tools we have at our disposal
- Toolkits and software engineering UIs...
  - Make programming easier to learn and debug, more powerful and more natural
- End-user programming...
  - Make programming more accessible to non-engineers

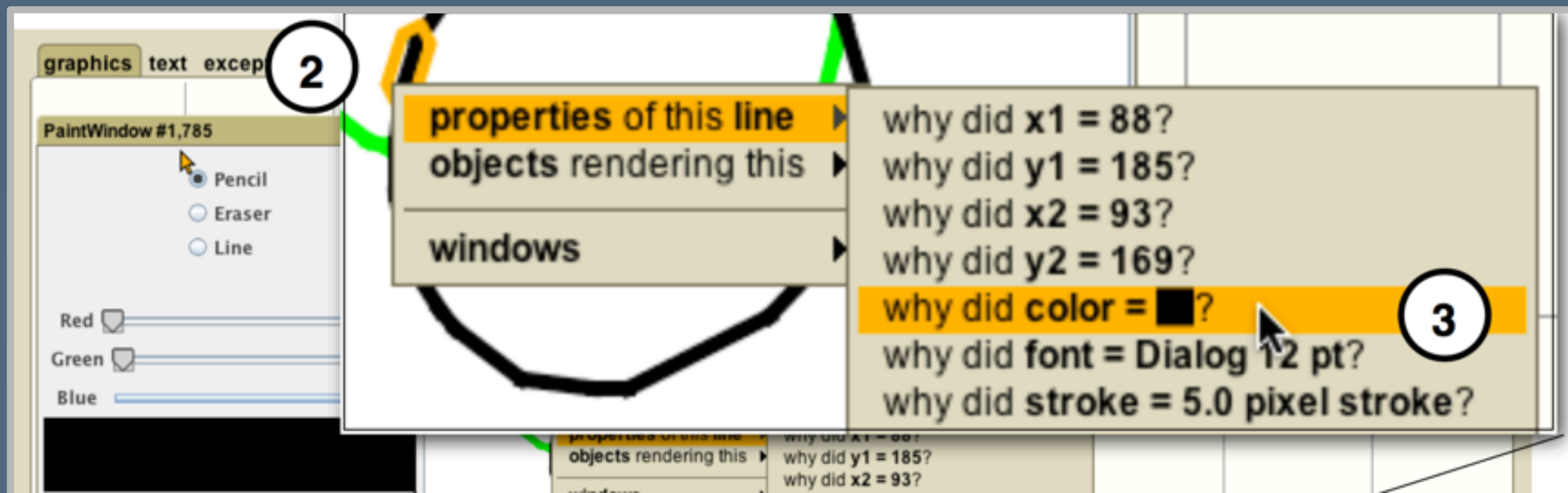
# Programming toolkits

- Seek to understand programmers' mental model and task goals
- Then, design better support!
- D3: Data-Driven Documents  
[Bostock, Ogievetsky and Heer, Visweek '11]



# Software engineering interfaces

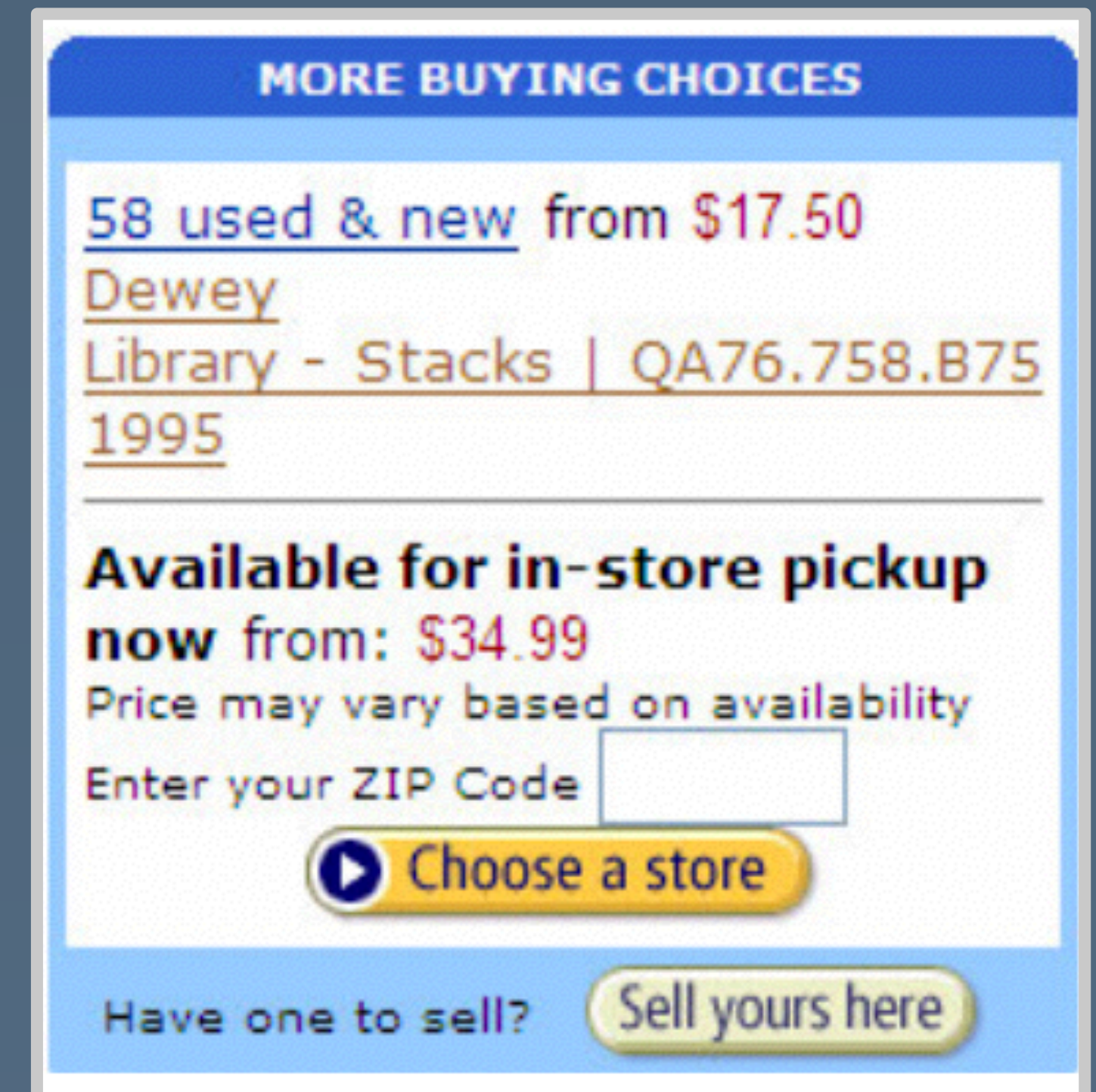
- Augment the development environment rather than the programming language
- Programmers often ask ‘why?’ questions of their programs. Could we support this directly?  
[Ko and Myers, CHI ‘08]



# End-user programming

- Lower the threshold to writing programs
- Allow users with little programming skill to author behaviors
  - e.g., Chickenfoot [Bolin et al., UIST 2008]

```
isbn = find('number just after isbn')
with (fetch('libraries.mit.edu')) {
  pick('Keywords');
  enter(isbn)
  click('Search')
  link=find('link just after Location')
}
// back to Amazon
if (link.hasMatch) {
  insert(before('first rule after "Buying"'),
  link.html)
}
```




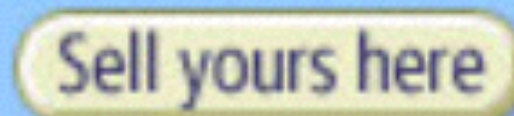
**MORE BUYING CHOICES**

58 used & new from \$17.50  
Dewey  
Library - Stacks | QA76.758.B75  
1995

---

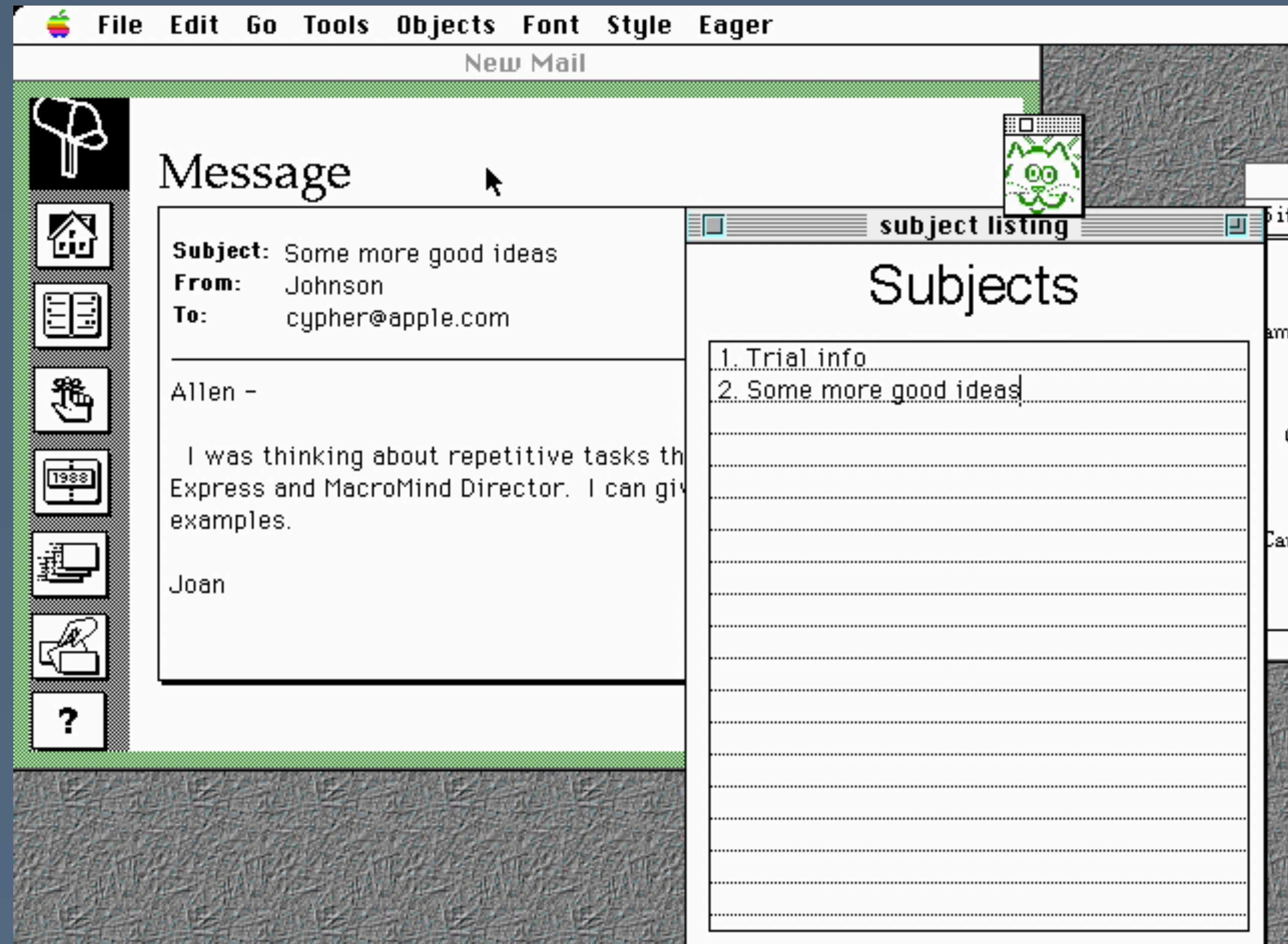
**Available for in-store pickup**  
**now from: \$34.99**  
Price may vary based on availability  
Enter your ZIP Code

 **Choose a store**

Have one to sell? 

# Programming by demonstration

- Induce a program behind the scenes
  - EAGER  
[Cypher, CHI '91]



# What's difficult about design and creation research?

- Design and programming tools:
  - Slight accelerations are easy; larger-scale improvements are not
- Design process:
  - Multidimensional and difficult to measure



# What's exciting about design and creation research?

- Existing creation tools are getting better every day
- The design process is now an accepted practice in industry, but still malleable
- Your contributions are generative: they lead to new designs and programs that others will create tomorrow