Design

CS 347
Michael Bernstein
Announcements

Project Brainstorm Round 1 due Friday

Methods and stats!

Methods lecture next Wednesday — Michael @ Penn

Stats session next Wednesday 6pm in Littlefield 103. If you don’t know how to do a t-test, one way and two way ANOVA, or chi square, and how to write up the results and effect size for a paper, join!

Thinking ahead to Project Brainstorm Round 2

Find a team!

Mixer ten minutes before the end of class this Friday
Articulating research contributions

Goal: work your muscles for what a research contribution in HCI looks like.

Pick papers that we’ve read, and riff to generate three ideas for follow-up research that could be done in the scope of this class.

These are not necessarily ideas that you need to follow up on with your project. We are evaluating your ability to generate them.

Due Friday
Course Overview

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Design

Evaluate

Implement
Design is not a static process.

It 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, also Donald Schön
Reflective practitioner

How does design work? Why does it work?

Donald Schön [1984] studied a variety of professionals, including designers, and articulated a theory of the how and the why that has remained influential.
Reflective practitioner

Design is not a “plan, then do” praxis

Instead, the designer is engaged in an ongoing conversation with the design

Critically, it’s only by observing the result of the doing can the designer engage in reflection, allowing them to improve
Reflective practitioner

Implication:

To improve the process, encourage more rapid reflection, or improve the quality of the reflection

To improve the tools, create alternatives that make reflection easier to do or more informative

You’ll read an excerpt from this book
Major themes of design research

Process
Tools
Design process

To improve the process, encourage more rapid reflection, or improve the quality of the reflection
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

[Kelley, TOIS ’84]

An iterative design methodology for user-friendly natural language office information applications

“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.”
How many designs? [Tohidi et al. 2006]

Prior practice: create your prototype, then show it to people to get feedback. But is this really optimal?

Study design:

Method: show participants low fidelity prototypes for a redesigned smart thermostat and ask for feedback

Control: show participants just one design ("the best")

Treatment: show participants three designs

Measure: quantitative ratings of the design, as well as valence of the verbal feedback
How many designs? [Tohidi et al. 2006]

“We found that when presented with a single design, users give significantly higher ratings and were more reluctant to criticize than when presented with the same design in a group of three.”

Why do you think this is? [1 min]

- Weakening demand characteristics
- Breaking out of functional fixation
Participatory design

[Schuler and Namioka '93]

Problem — the design process creates a power imbalance: the designer is in charge, and the user stakeholders are passive.

Participatory design is an alternative process, originally developed in Scandinavia (where everything is beautifully designed), that involves the stakeholders deeply in all stages of the design process.

Initial exploration, problem definition, developing ideas, evaluation

How will this help? What issues might crop up? How might you manage them? [1 min]
Elicitation studies

[Wobbrock and Morris 2009]

When entering a new design space (e.g., large multitouch tables, AR, mid-air interaction), how do we know which gestures would be the most effective for non-technical people?

Concept: tell people the command, and ask them to gesture in a way that they think should invoke that command. Then, look for agreement amongst these spontaneous gestures.
Elicitation studies

[Wobbrock and Morris 2009]

*Select Single*₁: tap

*Select Single*₂: lasso

*Select Group*₂: hold and tap

*Select Group*₁ and *Select Group*₃: Use *Select Single*, or *Select Single*₂ on all items in the group.

*Move*₁: drag

*Move*₂: jump

Object jumps to index finger location.

(What are the trade-offs with this method?)
Design tools

To improve the tools, create alternatives that make reflection easier to do or more informative
Sketch as input

[Landay, CHI '96]

Tighten the reflective loop by letting me create the low-fidelity prototype more quickly
Sketch as input

[Landay, CHI ’96]

Led to: Balsamiq
Explore alternatives

Tighten the loop by allowing me to explore design spaces and alternatives on a live version [Hartmann et al., UIST 2009]
Explore alternatives

Led to: Inventing on Principle [Victor 2012]
The Toastboard
Ubiquitous Instrumentation and Automated Checking of Breadboarded Circuits

Daniel Drew*, Julie Newcomb†, William McGrath‡, Filip Maksimovic*, David Mellis*, Bjoern Hartmann*
*UC Berkeley EECS, †University of Washington PLSE, ‡Stanford University HCI Group
ddrew73, fil, mellis, bjoern@berkeley.edu, newcombj@cs.washington.edu, wmcgrath@stanford.edu

Make errors visible [Drew et al. 2016]
Support visual design patterns

[O’Donovan, Agarwala, and Hertzmann CHI ’15]

DesignScape, from Adobe Research
What’s difficult about design research?

Design tools:
  Slight accelerations are easy; larger-scale improvements are not

Design process:
  Multidimensional and difficult to measure
What’s exciting about design 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
Find today’s discussion room at http://hci.st/room