Advanced Design of Interactive Systems

Lecture 1: Introduction

Course Objectives
- Participatory design
  - integrate users into the design process
- Redesign
  - vary methods over time
- Method creation
  - design your own methods and when to use them

Schedule

<table>
<thead>
<tr>
<th>Monday</th>
<th>Tuesday</th>
<th>Wednesday</th>
<th>Thursday</th>
<th>Friday</th>
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<tr>
<td>5 Feb</td>
<td>10 Feb 9:00-12:00 class EE01-EE02</td>
<td>11 Feb 9:00-12:00 class EE01-EE02</td>
<td>12 Feb 9:00-12:00 13:30-16:30 class EE01-EE02</td>
<td>13 Feb 9:00-12:00 class EE01-EE02</td>
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<td>Intro EE01-EE02</td>
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Design Philosophy
- Just do it
- Don’t argue — create a design artifact!
- Critical observation (user-oriented thinking)
  - Put yourself in the user’s shoes
- Situated interaction
  - Consider the user’s context of use
Generative Deconstruction

Emphasis on Participatory Design
Your group will design a system for another group

Process
Problem finding
Deconstruct an existing, system
Reconstruction
Create a new, principled design

Try to incorporate design principles
co-adaptive instruments

Course project

Work in groups of four
some activities are individual, others are in groups
Create a video prototype of an original design
that meets the needs of real users in a real setting
Build upon techniques you learned in the HCI Bootcamp
add participatory design and other techniques
Projects involve in-class exercises and homework
attendance is essential!

Design Brief

• Identify key issues for users: what do they need?
• Create a novel, principled design that takes advantage of generative design principles
• Design and run a participatory design workshop
work with users to explore new ideas
• Create a final video prototype video
• Present the final design to the class

Topic:

Find activities members of your group enjoy
sports activities
creative activities
political activism
...?
### General advice

First, find a specific, grounded design problem

Design it to be personalizable, shareable, reusable in different contexts, by multiple people, for different reasons

Ensure that you use instruments, substrates and co-adaptation

### Final presentation

15-minute oral presentation includes:
- design problem
- methods chosen and why
- design concept
  - explain in terms of design principles
- video prototype (maximum 5 minutes)
  - story of use, include breakdowns
- future work
  - how would you extend this to a complete system?

5-minute class discussion
- every group asks at least one question

Also due: video prototype, slides, final storyboard

### Grades

<table>
<thead>
<tr>
<th>Grades</th>
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<tbody>
<tr>
<td><strong>HCI Bootcamp values:</strong></td>
<td>Process, speed, collaboration</td>
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<tr>
<td></td>
<td><em>Just do it!</em></td>
</tr>
<tr>
<td><strong>Advanced course values:</strong></td>
<td>Justified design</td>
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<tr>
<td></td>
<td><em>Why do it this way?</em></td>
</tr>
<tr>
<td>Participation</td>
<td>20 %</td>
</tr>
<tr>
<td>Required exercises</td>
<td>20 %</td>
</tr>
<tr>
<td>Chosen exercises</td>
<td>20 %</td>
</tr>
<tr>
<td>Final Video Presentation</td>
<td>40 %</td>
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<tr>
<td>Focus on participatory design techniques</td>
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Quiz

A. Understanding users

1a. Is the following a good way to start an interview? Explain

[ ] Yes  [ ] No

What do you think about Excel?

How to ask questions

The form of the question provides the form of the response

If you want specific, real answers, you must ask the questions correctly

If not, you will get vague general answers that provide little help with design

Careful!
We are not conducting marketing surveys
Our goal is to better understand users to design a better system

Choose story questions that support design

Question order matters!!!
Start specific then general

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Choose story questions that support design

Question order matters!!!
Start specific then general
Start with directed then open

Quiz

1. Understanding users
   b. Ask a question (related to Excel) using the critical incident technique.

Critical incident technique

Focus on a recent, memorable event:
Describe the initial situation
Tell what happened, step-by-step, in as much detail as possible:
   What did you do?
   How did the system respond?
   What did you do next?

Was the situation resolved successfully?
   If not, what did you do?

Later:
   Was this typical?
   If typical, find a different example
   If unusual, find a typical example
**Critical object technique**

Identify an object that you recently created
What led you to create this object?
Tell what happened, step-by-step, in as much detail as possible:
  What did you do?
  How did the system respond?
  What did you do next?
Were you happy with the result?
  If not, what did you do?

Later:
  Was this typical?
    If typical, find a different example
    If unusual, find a typical example

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**Quiz: Understanding users**

1. Is this a good way to start an interview?
   What do you think about Excel?
   [ ] Yes  [ ] No
   Explain

2. Ask a question about Excel using the critical object technique:

3. What is the goal of a design interview?
   [ ] Gather opinions
   [ ] Get a tutorial
   [ ] Get a specific story
Quiz: Understanding users

4. Give an example of something an interviewee might say if the interview is going wrong:

- “I usually start by doing ...” — tutorial
- “I sometimes do this ...”
- “I think it should be like that...” — opinon
- “I hate it when it does this...”

... what you want are detailed stories!

Quiz: Understanding users

5. What is an interaction point?

Give an example:

Name three design activities that use interaction points:
- interviews
- scenarios
- video prototypes
Interaction Points

Title: Summarize what happened

Identify the sequence of events:
User acts – System reacts – User reacts
System acts – User reacts – System reacts

For each segment:
Sketch what happened (use Verplank’s starmen)
Describe what happened

Quiz: Understanding users

6.a What is a persona? Give an example.

6.b What is an extreme character? Give an example.

6.c How do extreme characters help your design?

Give an example:

Persona

Personal details: Name, age, gender
Physical description
Occupation, relevant activities
Representative or Extreme user?

Personality: Describe the person & design-relevant details
Likes, dislikes?
Capabilities, weaknesses?
Unusual characteristics?

Activities: Typical, breakdowns, user innovations

Identify the relationship with real users interviewed or observed.

Extreme character

Identify people who are extreme along one or more dimensions:

Normal hands  Arthritic hands
Takes vitamins  Cancer patient
Exercises regularly  Athlete
Adult  Child

It is useful to brainstorm ideas about what it means to be extreme in the context for which you are designing, even if you do not end up using such extreme characters.
Quiz: Design process

1.a What is the difference between video brainstorming and video prototyping?

**Video brainstorming:**
- Generate as many video ideas as possible, without judging them.

**Video prototyping:**
- Tell a story about using the system in a real-world context and judge it.

Video brainstorming

**Goal:**
- Generate individual ideas about how the user could interact with the system.

**Design resources:**
- Written brainstormed ideas.
- Each idea is directed by one person who controls:
  - Description of the idea
  - How to video the idea
  - Who will do what

However, different directors can video different variations of the same idea.

Video prototyping

**Goal:**
- Tell a story that illustrates how the user(s) interact(s) with the system through a series of interaction points.

**Design resources:**
- Design concept
- User profile, personas
- Use scenario with interaction points
- Video brainstormed ideas

Create a storyboard to illustrate how the interaction.

Follow the storyboard to create the video.

Quiz: Design process

1.b What is the difference between a video prototype and a marketing or concept video?
Quiz: Design process

1.b. What is the difference between a video prototype and a marketing or concept video?

Video prototypes: explore ideas with design team
Marketing videos: sell ideas to attract investors

Quiz: Design process

1.c. What is the difference between a current (use) scenario and a future (design) scenario?

Quiz: Design process

1.d. What is the difference between an instrument and an object-of-interest? Give an example of each.

Instrument: Pencil sharpener
Object-of-interest: Pencil
Quiz: Design process

1.e. What is the difference between a video prototype and a tutorial?

Video prototype: tells a story of how users in the future will interact with a proposed system, including breakdowns and context.

Tutorial: explains how the specific features work, without context.

Quiz: Design process

2.a. What are the four main phases of the design process? (hint: key types of design activities)
- Discovery
- Invention
- Design
- Evaluation

Each phase involves which three key activities?
- Collect or generate material
- Interpret or analyze material
- Produce a design resource

Four phases

Each phase contributes to the other phases:
- Evaluate the system
- Understand the user
- Design the system
- Generate new ideas

The process is iterative.
Generative Design

Each phase includes:

- Collecting or sampling information
- Analyzing information
- Generating design resources

- Does it work?
- Implications for design
- User insights
- User profile
- Design studies
- Analysis
- Interpret
- User profile
- Design alternatives
- Design axes
- Technical possibilities
- Design brief
- Design space
- Design possibilities

- User insights
- Design space
- Variations
- Constraints
- Design categories
- Design possibilities

- User needs
- User information
- Results
- Use data
- Design space
- Categories
- Constraints
- Design possibilities

- Expand
- Refine
- User insights
- System
- Use data
- Results
- User information
- User needs
- Design space
- Categories
- Constraints
- Design possibilities

- Understand users
- Evaluate system
- Generate ideas
- User insights
- Design space
- Variations
- Results
- User needs
- User information
- Constraints
- Design categories
- Design possibilities

- Generate new possibilities
- Select & refine possibilities
- Design space
- Variations
- Categories
- Constraints
- Design possibilities

- Design brief
- Design space
- Design alternatives
- Design axes
- Technical possibilities
- User profile
- Design possibilities

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Generative Design

Discovery
- Collect User Information
- Explore User Needs
- Produce User Insights

Invention
- Collect Possibilities
- Explore Categories
- Produce Design Space

Design
- Collect Constraints
- Explore Variations
- Produce Prototype

Evaluation
- Collect Use Data
- Explore Results
- Produce Implications

Quiz: Design principles

C. Instrumental Interaction involves three key properties. What are they? Describe them.

1. Reification
2. Polymorphism
3. Reuse

Reification

Turns concepts into (interface) objects

Interaction instrument
- Reification of a command into an interface widget

Example:
scrolling a document -> scrollbar

Examples
- Guidelines: reification of alignment
- Layers: reification of mode
Polymorphism

Extends commands to multiple object types

Common examples:
- Cut, paste, delete, move

Context-dependent commands

Homogenous groups
- If applicable to one object, then applicable to a group of same-type objects

Heterogeneous groups
- Applicable to a heterogeneous group if it has meaning for individual object types

Reuse

Captures interaction patterns for later reuse

Output reuse
- Reuse previously created objects
  - Example: duplicate, copy/paste

Input reuse
- Reuse previous commands
  - Example: redo, history, macros

Generative power: Three design principles

Reification
- Extends the notion of what constitutes an object

Polymorphism
- Extends the power of commands with respect to these objects

Reuse
- Provides a way of capturing and reusing interaction patterns

Quiz: Design principles

2. What is a co-adaptive system? Give an example.
Key phenomenon: *Co-adaptation*

- Users adapt to a new system: they **learn** to use it.
- Users adapt the new system to their own needs: they **appropriate** and change it.

Creative activities require both especially when integrating physical and digital information.

Create digital tools that are as intuitive, and learnable, as physical tools.

---

We learn (adapt to) a hammer’s properties

But we also adapt (or appropriate) other tools

Many physical tools are easy to appropriate

… why not software?
Reciprocal Co-adaptation

People adapt their behavior to technology
... they learn it
People adapt the technology for their own purposes
... they appropriate it
Computers adapt their behavior to people
... machine learning
Computers adapt human behavior
... training

Key phenomenon: Co-adaptation

Users adapt to a new system
they learn to use it
Users adapt the new system to their own needs
they appropriate and change it
Creative activities require both
especially when integrating physical and digital information
Create digital tools that are as intuitive, and learnable,
as physical tools

Quiz: Design principles

c. What is a substrate? Give an example. (extra credit)

Quiz: Design principles

3. What is a substrate? Give an example. (extra credit)
<table>
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<tr>
<th>Quiz: Design principles</th>
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<tr>
<td>c. What is a substrate?</td>
</tr>
<tr>
<td>1. Contains data</td>
</tr>
<tr>
<td>2. Manages constraints and relationships</td>
</tr>
<tr>
<td>3. Interprets rules</td>
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Layered substrates:
- Treat notes as pixels (bitmap editor),
- as notes in a score (Finale),
- or as musical notes (Open Music)
Course project

- Work in groups of four
  - some activities are individual, others are in groups

- Create a video prototype of an **original** design
  - that meets the needs of real users in a real setting

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  - add participatory design and other techniques

- Projects involve in-class exercises and homework
  - attendance is essential!

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Topic:

- Find activities members of your group enjoy
  - sports activities
  - cultural activities
  - creative activities
  - political activism
  - . . . ?