Advanced Design of Interactive Systems

Professor: Wendy Mackay mackay@lri.fr
TA: Philip Tchernavskij ptchernavskij@protonmail.com

ExSitu lab, Inria & Univ. Paris-Sud
14-22 February 2018

Schedule

Monday	Tuesday	Wednesday	Thursday	Friday
			14 Feb 9:00-12:00 13:30-16:30 EE01-EE02	
18 Feb 9:00-12:00 13:30-16:30 class EE01-EE02		**20 Feb** 9:00-12:00 class Amphi V	**21 Feb** 9:00-12:00 13:30-16:30 class EE01-EE02	**22 Feb** 14:00-17:00 final presentation

Course Objectives

Participatory Design of Interactive Systems

1. Detailed observations of interaction
   - User-oriented thinking
   - Critical observation

2. Principled design of interactive systems
   - Instrumental Interaction
   - Co-adaptation

Course project

Work in groups of 4-5
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

Use techniques you learned in HCI Bootcamp
plus participatory design and other techniques

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

Generative Deconstruction

Emphasis on Participatory Design
You will be the designer … and the user

Deconstruct an existing, system
1. Uncover critical problems

2. Create a new, principled design
based on co-adaptive instruments and other principles

Design Brief

- Identify key problems with an existing system, using: introspection, observation, interviews, questionnaires
- Design and run a participatory design workshop with users to explore new ideas
- Create a novel, principled design that takes advantage of generative design principles, including ***(at least)*** instrumental interaction and co-adaptation
- Create a video prototype video to illustrate the design

Topic:

Help users find, use, create, ...
local sports facilities
housing options
local eating & shopping
cultural activities
Paris-Saclay admin

Look for real problems ... how can you make it better?

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 and user profile
  justify based on user studies
- 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

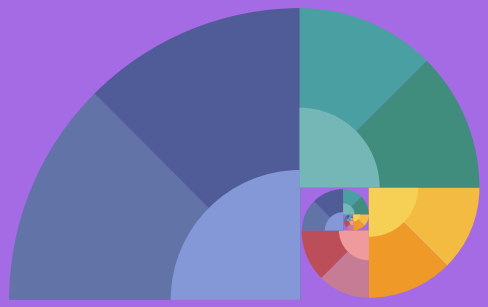
HCI Bootcamp valued: Process, speed, collaboration

Advanced course values: Creativity, principled design

Participation	20 %	
Class exercises	30 %	
Final Video Presentation	50 %	
Extra exercises	10 %	(bonus – you choose)

Focus on ***participatory design*** techniques

Quiz
Remembering HCI Bootcamp



Quiz

1. Understanding users
   a. 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 (habitable sub-languages)

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

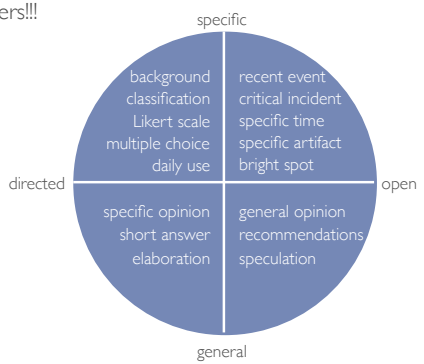
Choose questions that support design

Question order matters!!!

Start specific
then general

Start with directed
then open

Start with facts
then opinions



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?

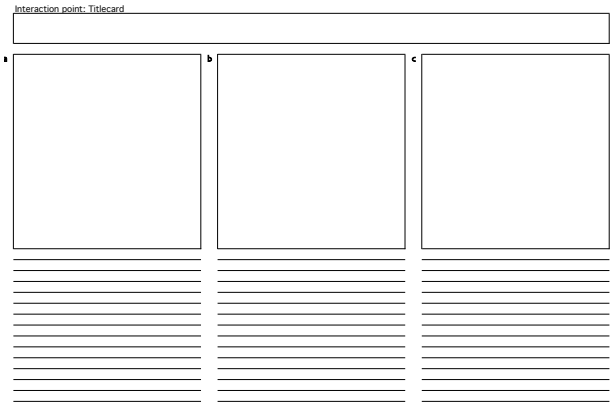
Were you happy with the result?
If not, what did you do?

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

Quiz

1. Understanding users
   c. What are interaction points? Where do they come from? Where can you use them?

Interaction Point



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

1. Understanding users
   d. What is a persona? What is an extreme character? Why do we use the latter?

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 characterstics?
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	→	Athelete
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

2. Design process
   a. What is the difference between *video brainstorming* and *video prototyping*?

Video brainstorming

Goal: Video individual ideas about how the user could interact with the system

Design resources:
Written brainstormed ideas

Each idea has *one* director 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

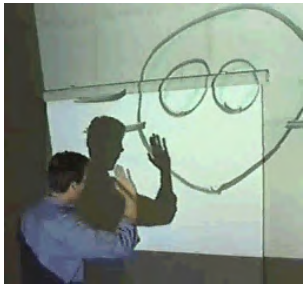
Follow the storyboard to create the video

Quiz

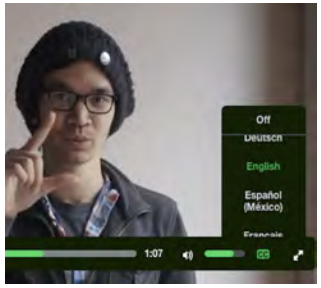
2. Design process
   b. What is the difference between a *video prototype* and a *marketing / concept video*?

Quiz

Video prototypes: designers sketch & explore design options with users and design team



Marketing videos: designers envision ideas to attract investors & other stakeholders



Quiz

2. Design process
   c. What is the difference between a *use* scenario and a *design* scenario?

Use Scenario vs. Design Scenario

Use scenario describes current activities
tells a story with a series of action points

Design scenario builds on the use scenario
envistions a future version with a new technology

Both include realistic personas, realistic context,
and explore breakdowns, workarounds and surprises

Quiz

2. Design process
   d. What is the difference between an *instrument* and an *object-of-interest*? Give an example of each.

Quiz

2. Design process
   d. What is the difference between an *instrument* and an *object-of-interest*? Give an example of each.

Quiz

2. Design process
   e. What is the difference between a *video prototype* and a *tutorial*?

Quiz

2. Design process
   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

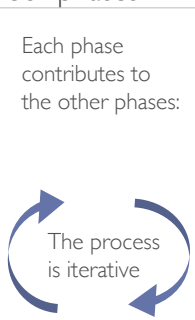
Quiz

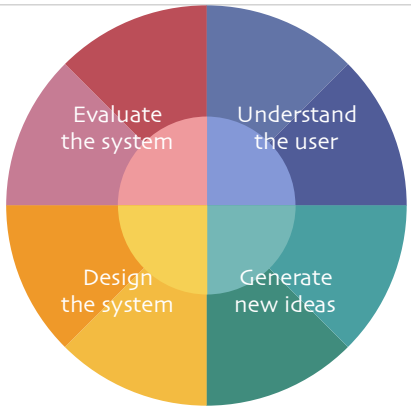
f. What are the four main phases of the design process? (hint: key types of design activities)
   - Discovery
   - Invention
   - Design
   - Evaluation

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:





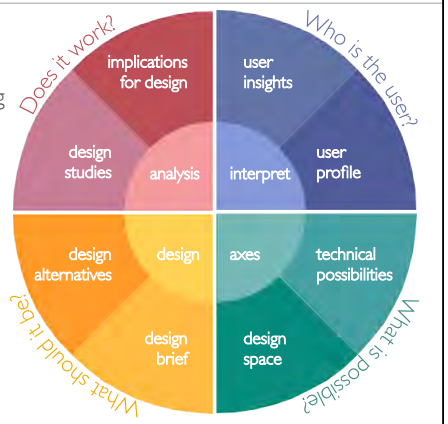
Generative Design

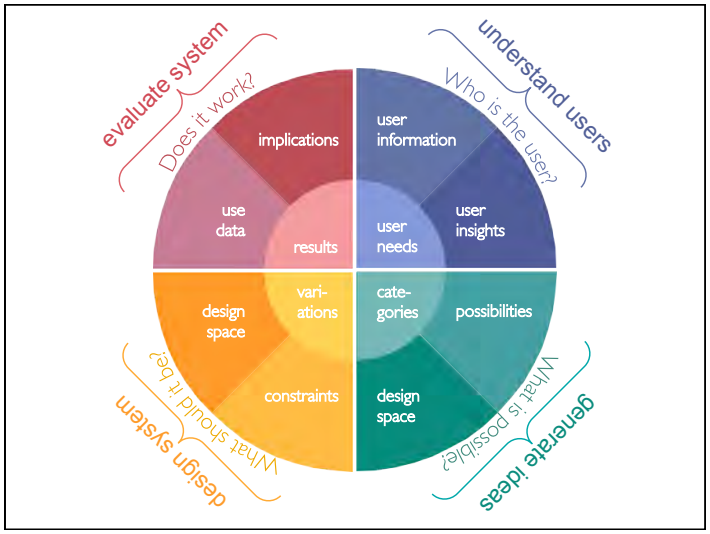
Each phase includes:

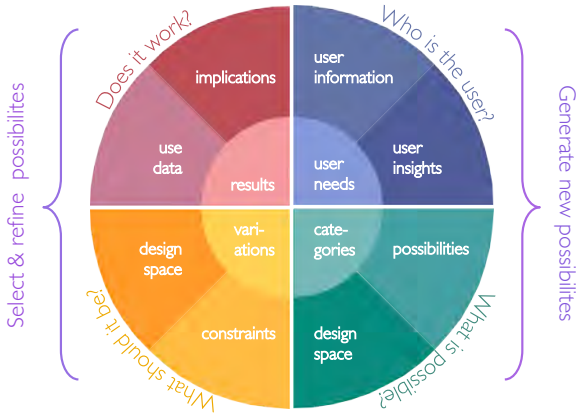
Collecting or sampling information

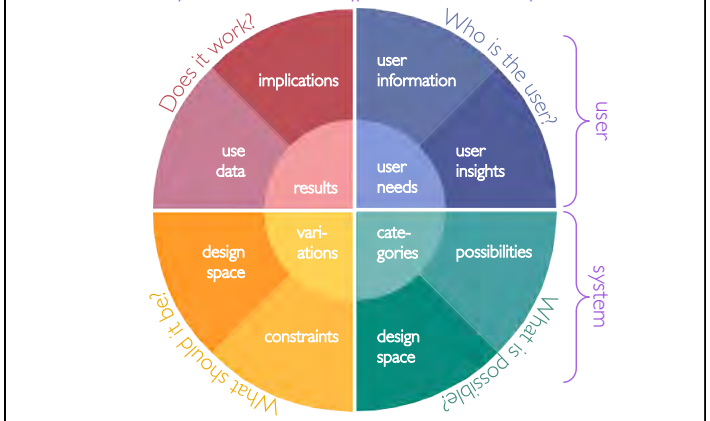
Analyzing information

Generating design resources









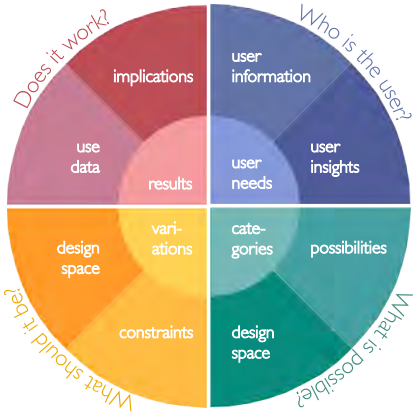
Generative Design

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

3. Design principles

   a. 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

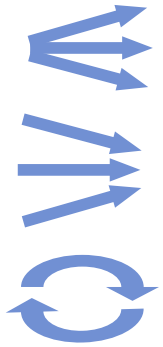
Input reuse
- Reuse previous commands
- Example: redo, history, macros

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

3. Design principles

   b. 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

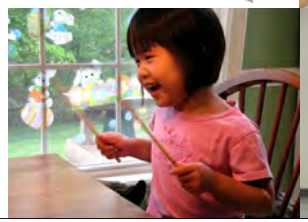
Create digital tools that are as intuitive, and learnable,
- as physical tools

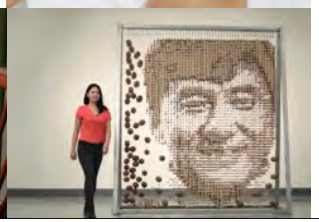
We learn (adapt to) a hammer's properties

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

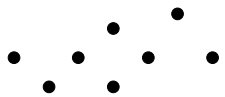
3. Design principles

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

Quiz

3. Design principles

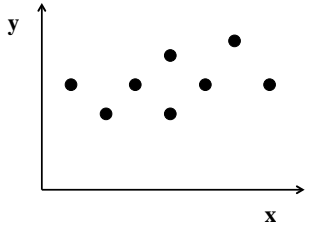
   c. What is a substrate? Give an example. (extra credit)



Quiz

3. Design principles

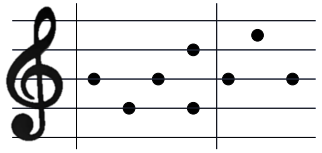
   c. What is a substrate?
   Coordinate system



Quiz

3. Design principles

   c. What is a substrate?
   Music system



Quiz

3. Design principles

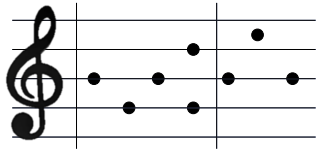
   c. What is a substrate?

   Contains data
   Manages:
   rules
   constraints
   relationships

Quiz

3. Design principles

   c. What is a substrate?
   Music system



Layered substrates:
Treat notes as pixels (bitmap editor),
as notes in a score (Finale),
or as musical notes (Open Music)

Multi-Disciplinary Design Methods

Understand the user	Analyse the user	Invent new ideas	Prototype the system	Evaluate the system	Redesign the system
'Fly-on-the-wall' observation — Ethnography	Interactive Thread — HCI	Oral brainstorming — Psychology	Paper prototyping — Participatory Design	Focus group — Marketing	Generative walkthrough — HCI
Critical incident interview — Human Factors	Contextual Inquiry — Anthropology	Design space — Design	Video prototyping — Participatory Design	Usability study — Human Factors	Technology probe — Design/Arts
Questionaire — Sociology	Task analysis — Human Factors	Sketching — Design/Arts	Wizard of Oz — Human Factors	Design heuristics — HCI	Branching storyboard — HCI
Cultural probe — Design/Arts	Scenario analysis — Activity Theory	Video brainstorming — Participatory Design	Software simulation — Computer science	Design walkthrough — Psychology	Participatory workshop — Design/HCI
Grounded Theory — Cognitive Psychology	Protocol analysis — Cognitive Psychology	Design room — Design/Arts	Design scenario — HCI	Design critique (crit) — Design/Arts	Improv — Comedy

Multi-disciplinary Design Methods

HCI design techniques are *derived* from
diverse disciplines

No individual technique is best
nor can it stand alone

All have advantages and disadvantages,
each is influenced by the norms of the parent discipline

We can choose from among these techniques
and modify them as needed
or create our own

Gathering information about users

More advanced techniques include:

Cultural probe	Users try objects that prompt reflection
Technology probe	Users use technology to reflect
User workshops	Hands-on participatory design with users
Prototypes	Users test technology
Log study	Record users actions over time
Diary study	Users record their own actions
Interactive thread	Interact with users at an event
Focus group	Ask customers about a product
Lab study	Determine cause/effect relationships

Design Brief

- Identify key problems with an existing system, using: introspection, observation, interviews, questionnaires
- Design and run a participatory design workshop with users to explore new ideas
- Create a novel, principled design that takes advantage of generative design principles, including ***(at least)*** instrumental interaction and co-adaptation
- Create a video prototype video to illustrate the design

Topic:

Help users find, use, create, ...
local sports facilities
housing options
local eating & shopping
cultural activities
Paris-Saclay admin

Look for real problems ... how can you make it better?