Wednesday

Morning
Create paper prototypes
Ex #18 Shoot video prototype #1
Start poster

Afternoon
Evaluation lecture
Ex #19 Design walkthrough
Ex #20 Hypotheses (experiment design)
Ex #21 Improvements
Redesign principles lecture

Poster

Summary poster

- Group: Project title, number, names
- Design Concept: What is the new idea?
- User information: Who is it for? How is it used?
- Storyboard: How do these users interact with it?
- Design diagram: How does it work?
- Evaluation: Key issues
- Redesign: Key improvements, justifications
Summary Poster

Summarize design resources

Shorter is better
Limit words
Highlight key points

Capture the design and redesign process

Generative Design

Discovery
Who is the user?

Invention
What is possible?

Design
What should it be?

Evaluation:
Does it work?

Video Prototyping

Not the same as Video Brainstorming!

Video Prototyping
Video Prototypes

Set up Video Clipper:
- Titlecard 1: Prototype name, group, Date
- Series of titlecards from storyboard
- Final credits: Group number, your names

Find a quiet place … but let us know where you are!!!
- Bring mockups & supplies
- Whiteboards are helpful

Shoot everything in order
- If you make a mistake, reshoot

Design Walkthrough

Step-by-step evaluation of sequential material
to identify as many problems as possible at each step

Similar to brainstorming:
- Goal is to identify maximum quantity of problems
- Contrast with brainstorming:
  - Do not defer judgement

Based on Structured Walkthroughs (Yourdon, 1979)

- Goal: Find bugs in code
- Technique: Systematic step-by-step analysis
  of a document by a small group
- Principles: Line-by-line analysis
  Constructive criticism
  Limited time
Design Walkthrough

Types of comments:
- Focus on material, not author
- Constructive, not destructive
- Specific, not general
- Problems then questions then suggestions

Examples:
- “The text is too small to read”
- “The user can’t see where to change the setting”
- “That task takes four steps”

Authors: Accept the problems, but do not discuss solutions!
Try to find as many issues as possible – don’t solve them.

Design Walkthroughs in the real world

Groups:
- peers (not bosses!)
- small 4-8 works well
- diverse include diverse perspectives

Adopt specific roles:
- technical Is there an error or problem?
- user Is it hard to do?
- manager Is this function necessary?

Apply design rules, principles or perspectives:
- Norman’s rules
- Shneiderman’s rules

Appropriate for many types of material

Originally for programmers and their code

However it works well for:
- Text documents: articles, manuals, specifications, reports
- Design resources: design scenarios, storyboards, paper prototypes, video prototypes
**Design Walkthrough Roles**

Each group evaluate another group’s video prototype
- Group A evaluates group B
- Group B evaluates group C etc.

When your group is evaluated:
- Moderator: Ensure everyone participates (both groups)
  - Show video
  - Stop discussion
- Scribe: take notes
- Everyone: contribute feedback (both groups)

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**Design Walkthrough**

Procedure:
- Choose moderator and scribe
- Show the full video
- Show each interaction point
  - Any critiques?
  - Any suggestions?

When presenting, Remember:
- Do NOT discuss: clarifications only
- Do NOT defend: just note problems
Later, you can decide which feedback to implement

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**Evaluation**

*Does it work?*

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**Simple experiment**

Goal: Choose the best design alternatives by watching users try the prototype

Procedure:
- Describe the design objective
- Identify several alternatives
- Choose the independent and dependent
- Specify the null hypothesis and make a prediction
- Set up the test conditions to compare each condition
  - Use at least three real users
- Analyse the results: are they significantly different?
### Design a simple experiment

Specify the **functionality** offered to users
- What does the system do?

Specify the **alternative interaction techniques**
- How does the user accomplish it?

Specify the **independent variables** (factors)
- Experimenter decides on the values

Specify the **dependent variables** (measures)
- User behavior determines the values

Specify tasks user will perform (**operationalize behavior**)
- Specify experimental and control groups

Specify appropriate statistical tests
- Is the difference real?

### Example

**Compare linear and circular menus**

State the null hypothesis ($H_0$):

There is no difference in performance between users in terms of time or error when selecting an item from a linear or a circular menu regardless of type of menu, number of menu items or previous experience.

### Specify the independent variables (factors)

Independent variables (factors) are those we want to vary or control. The combinations of variables define the conditions.

<table>
<thead>
<tr>
<th>Independent variables</th>
<th>Values</th>
</tr>
</thead>
<tbody>
<tr>
<td>Type of menu</td>
<td>linear, circular</td>
</tr>
<tr>
<td>Number of items</td>
<td>3, 6, 9, 12, 15</td>
</tr>
<tr>
<td>Expertise</td>
<td>expert, novice, intermittent</td>
</tr>
</tbody>
</table>

$[2 \times 5 \times 3] = 30$ unique conditions
Specify the dependent variables (measures)

Dependent variables depend on the user's behavior
Also called measures because they measure user's behavior

For a reliable statistical test,
you need sufficient measures per condition

Rule of thumb:  ~ 12 for small-n statistics (student’s t)
               ~ 30 for normally distributed tests

Dependent variable might include:
Time to select an item
Number of errors
What else?

Operationalize the behavior

Operationalize the behavior

Define the specific menu selection task
Ensure that the conditions are as similar as possible:
Same labels for the menu items
Same location of the menu on the screen (centered)
Highlight the item to select (to avoid searching for it)

Run the experiment

Control any factors that might bias the results:
All subjects receive the same instructions
All subjects perform tasks under the same conditions
All instructions are simple and clear
Informal contact kept to a minimum

Double blind experiment:
Neither the experimenter nor the subject
know which group receives which treatment
Can our experiment be double blind?
Run the experiment
- Obtain informed consent from the subjects
- Ensure that subjects remain anonymous
- Associate a number with each subject
- Choose conditions based on those numbers
- Gather experimental data
- Test that they are reliable and valid
- Minimize data treatment and preserve raw data

Collect data
- Ensure that the data log is human-readable yet easy to analyze by both people and machines

Prediction ≠ Null hypothesis
- Always record your subjective predictions before looking at the results
- Null hypothesis example: Circular and linear menus are equal in performance under all conditions
- Prediction example: “I think that circular menus will be faster than linear menus regardless of experience and the number of menu items”
- Other possible predictions:
  - Linear menu performance will decrease with more items
  - Circular menu performance will drop as more items are added

Exercise: Plan an Experiment
- Goal: Choose the best interaction technique among several alternatives
- Procedure
  - Identify the key independent variables (factors)
  - Identify the key dependent variables (measures)
  - Operationalize the behavior and define test conditions
  - Run the experiment with at least 3 subjects
  - Analyze the data: are they significant?
Exercise: Design a simple experiment

Choose a single interaction point
Identify at least two additional alternative forms of interaction

Specify:
- Independent variables
- Dependent variables
- Null Hypothesis
- Prediction

Generative Design … is REDESIGN!

Discovery
Who is the user?

Invention
What is possible?

Design
What should it be?

Evaluation
Does it work?

Redesign
How to improve it?

Remember: Design is an iterative process …

Design artifacts serve as resources for redesign
Redesigning your design

You’ve created a video prototype … NOW WHAT?
How can you improve it?

Modify the scenario:
  - Consider breakdowns, surprises, alternatives
Lengthen the scenario:
  - Add interaction points
Create an additional scenario:
  - Consider new personas, new situations, new designs
Create a branching scenario:
  - Compare design alternatives in context

Revised design concept

Trade-off between power and simplicity:
Less is More

Find a key object of interest for the user:
Make it persist
Make it interactive

Example:
  - Search for a route
  - Create a ‘route’ object
  - Create an interactive route object
    - modify, extend, transform
    - share, compare . . .

Improving your design

Does it empower the user?
  - Allows user to express options, save preferences
  - Choose among useful alternatives, reuse options
Or is it “AI magic”?
  - User gets ‘correct answer’ by some magic algorithm

Don’t forget:
  - How does the user:
    - Set up: express preferences?
    - Breakdowns: know what is wrong?
    - Fix problems?
  - Consider repeated actions:
    - Is it tedious to repeat similar actions?

Technical improvements

Visual:
  - Explanatory intertitle cards
  - Use pause for time-lapse effect
  - Use transparencies and post-its for dynamic effects
  - Zoom in, zoom out, then video while zooming in
  - Stabilize the camera (tripod, support, body)
  - Stabilize the background (postit notes or tape)
  - Include detail: paper prototypes and story

Auditory:
  - Limit background sound (find an empty room)
  - Consider how much voice-over is needed
  - “Three” “Two” “” “” technique
Who is the audience for the video?

<table>
<thead>
<tr>
<th>Audience:</th>
<th>Emphasis on:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Users</td>
<td>Clarifying design problem</td>
</tr>
<tr>
<td></td>
<td>Identifying design opportunities</td>
</tr>
<tr>
<td></td>
<td>Bottom-up, contextual descriptions</td>
</tr>
<tr>
<td>Management</td>
<td>Describing design solutions</td>
</tr>
<tr>
<td></td>
<td>Justifying design solutions</td>
</tr>
<tr>
<td></td>
<td>Top-down, abstract descriptions</td>
</tr>
<tr>
<td>Team members</td>
<td>Revealing design problems</td>
</tr>
<tr>
<td></td>
<td>Exploring design solutions</td>
</tr>
<tr>
<td></td>
<td>Both top-down and bottom-up</td>
</tr>
</tbody>
</table>

Exercise: Video prototype 2

Goal:
- Add at least three interaction points
- Add at least one breakdown
- Include at least two design alternatives

Review design resources: what is missing from your scenario?
- Breakdown?
- Unanticipated behavior?
- Repeated activity?
- Combining features?
- New people?
- New situations?
- Set up features?
- Modification features?

What to avoid

- No auditory or haptic alarms:
  - Do not create an ‘electronic nag’
- No “artificial intelligence magic”
  - Let the user explore the data
  - Don’t come up with a magic solution
- No hardware-only solutions
  - Focus on the interaction with the software even if you have innovative hardware
- No one-feature systems
  - You must have a concept

Iterative design means redesign

Within an iterative design process, redesign is more important than initial design

- do not just “do it again”
- reflect on your designs in context
Improvements

Users experience technology in the real world
Never assume everything will be ‘perfect’

Consider:
Technical breakdowns
The wireless connection is down
Situation breakdowns
User is distracted while crossing the street
Extreme breakdowns
User cannot physically control the interface

Exercise: Improvements

Consider results of design walkthrough
Reassess your design concept
Can you create a simpler, more powerful concept?

Explore breakdowns
Identify at least three possible breakdowns
How do they affect the design of your system?
How can you address them?

Modify your design with the revised concept
Include three new interaction points
Show how to address breakdowns

Friday

Morning
Ex #22 Generative walkthrough
Ex #23 Revised concept

Afternoon
Ex #24 Storyboard #2
Ex #25 Video prototype #2

For Monday
Final poster
Final video prototype
Final presentation slides
What are socio-technical principles?

Social scientists conduct extensive field studies and provide deep insights in the form of socio-technical principles about how people interact with technology in context.

But it is difficult to translate these principles into specific designs.

So …

How do we incorporate socio-technical principles into the design process?

Generative Walkthroughs

First **deconstruct** what users do:

- Who is the user?
- What is the technology?
- What is the user’s context?
- What is the interaction like?

Then **reconstruct** the design:

- to design a new technology or
- to fix an existing one
Generative Walkthroughs: Creative redesign

Structured walkthroughs
Systematic critique of design artifacts, such as scenarios & storyboards

plus
Focused brainstorming
Generation of novel ideas, based on socio-technical principles

Exercise: Generative Walkthroughs
Analyze storyboard I from the perspective of co-adaptive systems
Interaction instruments

Conceptual model

Two levels of interaction: mediation

Interaction instruments

Conceptual model

Two levels of interaction: mediation

Instruments and modes

An instrument turns a mode into an object

Activating a mode = activating an instrument

Spatial mode: pointing

Temporal mode: selection

Cost of activation

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

Example: text search instrument

Classic search:
Sequential
Modal

Search instrument:
Show all occurrences
Allow replacing occurrences in any order

Augmented scrollbar
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

Exercise: Generative Walkthroughs

Analyze storyboard 1
from the perspective of co-adaptive systems

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Co-adaptive Systems

scenario or storyboard

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Design Diagram

Capture the essence of your design concept with a diagram

Examples:
- exploded diagram with key functions
- process diagram with arrows

Design Concept

Refine the design concept

Goal: to provide an overall, guiding principle for your design

Consider your first design
- Who is it really for?
- What should it do?
- Can you be more specific?
- Is there an overall design angle?

State the concept in one sentence:
- What is the user’s problem and what is your original solution?
Storyboard 2

Exercise: Storyboard 2

- Revise your first storyboard to reflect ideas from the walkthroughs according to your revised design concept.
- Include at least one breakdown and three new interaction points.
- Add the new titlecards to Video Clipper.
- Shoot video prototype 2 from storyboard 2.

Redesign

Presentation

Final presentation

Oral presentation
- 10 minutes:
  - title slide
  - user profile & personas
  - design problem & design concept
  - design diagram
  - video prototype
  - justification
  - conclusion
- (maximum 5 minutes)
- (key improvements & why)

5 minutes:
- class discussion
- (group members ask questions)
Final presentation

To be graded by a jury:
- Final poster
- Final presentation with Video Prototype II

Bring:
- Ipad
- Design Folder with supplies
- Paper folder with filled in handouts
- Physical mock-ups

Remember:
- 10-minute talk
- 5 minutes for questions
- Fill out the final evaluation form