Design and Prototyping

No screens

Prof. Lydia Chilton
COMS 4170
4 October 2018

Say your name
I teach **UI Design** (spring) and **Advance Web Design Studio** (fall).
I’ve been teaching web dev for 10 years

2008-2010
MIT

2016-2017
Stanford

2018-present
Columbia
What do you already know about design?
**Iterative Design Process**

- Requirements analysis
- Preliminary and detailed design
- Implementation
- Evaluation

**Sketching**

**Heuristic Evaluation**

http://www.nngroup.com/articles/how-to-conduct-a-heuristic-evaluation/

- Evaluators (3–5) individually and systematically inspect the UI, comparing it with a set of general (and, optionally, domain-specific) evaluation heuristics
  - May need to document a specific task to evaluate and steps for performing it if evaluators are not familiar with the domain
  - Go through UI at least twice
  - Note each problem individually
- Observer may take notes
  - Eliminates note-taking burden for evaluator
  - Observer is similar to an experimenter, but
    - Records, rather than interprets (i.e., evaluator does the evaluation)
    - Provides help (especially if evaluator is not familiar with the

**Persona**

- Description of an archetypal user of the system
  - Each persona represents a stereotypical example of a class of prospective users
  - Usually part of a set, covering a range of users

**Use Scenario**

- Description of a representative way in which the system will be used
  - Each scenario tells a story
  - Often written to be rich in detail to capture realistic use cases

**Hi-Fi vs. Lo-Fi Prototypes**

- Prototypes
  - Get/refine ideas for real system
  - Perform usability testing
  - Do advance demos
- Hi-Fi prototypes
  - Often use computer-based tools
  - Provide look & feel of a real system
  - Slow creation/turnaround
- Lo-Fi prototypes
  - Often use paper (and other low-tech material)-based tools
  - Provide rough approximation of a system

**Paper Prototype Ingredients**

- Paper
- Construction paper
- Index cards
- Post-it notes
- Scissors
- Glue
- Tape
- Permanent
- Single-sided temporary tape (e.g., 3M Scotch® 911 Removable Magic™ Tape)
- Double-sided temporary tape (e.g., 3M Scotch® 667 Removable Double-Coated Tape)
- Markers
- Transparent
Why is design iterative?
What’s wrong with the waterfall model?
What's wrong with the waterfall model?
Design involves risks

- What if a touch screen can’t be implemented?
- What if this device is so slow it’s unusable?

Iterative Design Process

- Requirements analysis
- Preliminary and detailed design
- Implementation
- Evaluation

How can we keep up with the competition?
Spiral Model of Software engineering
Barry Boehm, 1988

Every iteration should experiment with the next biggest risk.

How to achieve the perfect gradient on app icons?

Does touch work?

All new concepts are risks. They must be prototyped?
In this video, what are new concepts?

Write them down now, we will list them together after the video
What new concepts should we prototype?
Initial Prototype:
What did they prototype and how?
What new concepts did they prototype?

Drone projection

User interaction with projection

How did they prototype them?

Can the drone carry the stuff?

Can users select from menu?

Can users select symbols?

Can users select outdoors?

Can the drone detect hand position?
What was the biggest new risk they discovered during prototyping?

DRIFT
Design involves **risks**

- Requirements
- Design
- Implement
- Fix bugs
- Create unboxing experience
- Done!

What if it drifts so much it’s unusable?
My Research:

How does the iterative design process work at a mechanical level?
Iterative Design empirically.
But the models we have of it are too high-level.
An Interactive Pipeline for Creating VisuaBlends

Keeps you strong.

Lydia Chilton
Savvas Petridis
We want to help people create visual blends for their own messages.

How can we decompose the iterative design process to make visual blends in independent microtasks?
Design Pattern: Single Shape Mapping

1. Two objects are integrated into one object
2. Both objects are individually identifiable
<table>
<thead>
<tr>
<th>Turn off</th>
<th>Cell phone</th>
<th>Turn off + Cell phone</th>
</tr>
</thead>
<tbody>
<tr>
<td><img src="image" alt="Light Switch" /></td>
<td><img src="image" alt="Cell Phone" /></td>
<td></td>
</tr>
</tbody>
</table>
Starbucks + Summer
**Inputs:** Two Concepts

Starbucks  
Summer
<table>
<thead>
<tr>
<th>Brainstorm associations</th>
<th>Starbucks</th>
<th>Summer</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>store, frappuccino</td>
<td></td>
</tr>
</tbody>
</table>

**Inputs:** Two Concepts
**Inputs:** Two Concepts

<table>
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<tr>
<th>Brainstorm associations</th>
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<td>Summer</td>
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<tr>
<td>-------------------------</td>
<td>-----------</td>
<td>--------</td>
</tr>
<tr>
<td>Find images of objects</td>
<td><img src="image" alt="Starbucks" /></td>
<td><img src="image" alt="Starbucks" /></td>
</tr>
<tr>
<td>Annotate shapes</td>
<td>store, frappuccino</td>
<td></td>
</tr>
<tr>
<td>Inputs: Two Concepts</td>
<td></td>
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<tr>
<td><strong>Brainstorm</strong></td>
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<td>associations</td>
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<tr>
<td><strong>Annotate</strong></td>
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<tr>
<td>shapes</td>
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<tr>
<td><strong>Annotate</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>coverage</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Starbucks</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>store, frappuccino</td>
<td></td>
<td></td>
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<tr>
<td><strong>Summer</strong></td>
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<tr>
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<td>--------------</td>
<td>------------</td>
</tr>
<tr>
<td></td>
<td>beach, sun,</td>
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<td></td>
<td>swim</td>
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<td></td>
</tr>
<tr>
<td>of objects</td>
<td></td>
<td></td>
</tr>
<tr>
<td>beach, sun, swim</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

The image includes icons representing 'Starbucks' and 'Summer', with beach and sun icons illustrating the association of the concepts.
<table>
<thead>
<tr>
<th>Brainstorm associations</th>
<th>Summer</th>
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</thead>
<tbody>
<tr>
<td>Starbucks</td>
<td>beach, sun, swim</td>
</tr>
<tr>
<td>Find images of objects</td>
<td></td>
</tr>
<tr>
<td>Annotate shapes</td>
<td><img src="image1.png" alt="Image" /> <img src="image2.png" alt="Image" /></td>
</tr>
<tr>
<td>Annotate coverage</td>
<td><img src="image3.png" alt="Image" /> <img src="image4.png" alt="Image" /> Part of object</td>
</tr>
<tr>
<td>Brainstorm associations</td>
<td>Starbucks</td>
</tr>
<tr>
<td>-------------------------</td>
<td>----------------</td>
</tr>
<tr>
<td>Find images of objects</td>
<td>store, frappuccino</td>
</tr>
<tr>
<td>Annotate shapes</td>
<td><img src="image1.png" alt="Starbucks logo" /> <img src="image2.png" alt="Cup of frappuccino" /></td>
</tr>
<tr>
<td>Annotate coverage</td>
<td>All of object</td>
</tr>
</tbody>
</table>
**Inputs:** Two Concepts

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</table>

**Annotate shapes**
- **Starbucks**: All of object, Part of object
- **Summer**: Part of object

**Annotate coverage**
- All of object
- Part of object
Inputs: Two Concepts

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<td><img src="image2" alt="Summer" /></td>
</tr>
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</table>

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<tr>
<th>Annotate shapes</th>
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<tbody>
<tr>
<td><img src="image3" alt="Starbucks" /></td>
<td><img src="image4" alt="Summer" /></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Annotate coverage</th>
<th>Starbucks</th>
<th>Summer</th>
</tr>
</thead>
<tbody>
<tr>
<td>All of object</td>
<td><img src="image5" alt="Starbucks" /></td>
<td><img src="image6" alt="Summer" /></td>
</tr>
<tr>
<td>Part of object</td>
<td><img src="image7" alt="Starbucks" /></td>
<td><img src="image8" alt="Summer" /></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Prototype blend</th>
</tr>
</thead>
<tbody>
<tr>
<td><img src="image9" alt="Prototype" /></td>
</tr>
</tbody>
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<td></td>
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**Prototype blend**

Two objects are integrated into one object
Both objects are identifiable
Prototype blend

Inputs: Two Concepts

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<td></td>
</tr>
<tr>
<td>Find images</td>
<td>![Starbucks image] ![Frappuccino image]</td>
<td>![Popcorn image] ![Sun image]</td>
</tr>
<tr>
<td>of objects</td>
<td>![Starbucks image] ![Frappuccino image]</td>
<td>![Popcorn image] ![Sun image]</td>
</tr>
<tr>
<td>Annotate</td>
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<td>![Popcorn image] ![Sun image]</td>
</tr>
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<td>Part of object</td>
</tr>
<tr>
<td>coverage</td>
<td>![Starbucks image] ![Frappuccino image]</td>
<td>![Popcorn image] ![Sun image]</td>
</tr>
<tr>
<td>Prototype</td>
<td></td>
<td></td>
</tr>
<tr>
<td>blend</td>
<td>![Starbucks image] ![Frappuccino image]</td>
<td>![Popcorn image] ![Sun image]</td>
</tr>
<tr>
<td>Evaluate</td>
<td></td>
<td></td>
</tr>
<tr>
<td>prototype</td>
<td>![Starbucks image] ![Frappuccino image]</td>
<td>![Popcorn image] ![Sun image]</td>
</tr>
</tbody>
</table>

Output: A visual blend

Two objects are integrated into one object
Both objects are identifiable
Prototype blend

**Inputs:** Two Concepts

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</table>

- **Brainstorm associations**
- **Find images of objects**
- **Annotate shapes**
- **Annotate coverage**
  - All of object
  - Part of object
  - Part of object
  - Part of object

**Prototype blend**

**Evaluate prototype**

- Two objects are integrated into one object
- Both objects are identifiable

Output: A visual blend
Study 1: Independent Microtasks

First iteration: 11 of 16 blends
Study 1: Independent Microtasks

First iteration: 11 of 16 blends
Second iteration: 16 of 16 blends
Study 2: Blends for Messages

Public Service Announcement
“Wash your hands. It’s the smart move.”

Concept Pair:
Hand-washing + Smart
Study 2: Blends for Messages

Advertisement
“Joe’s Coffee: Open Late”

Concept Pair:
Joe’s Coffee + Night
Study 2: Blends for Messages

Advertisement
“Panel Discussion: Women in Computer Science”

Concept Pair:
Women + Computer Science
Study 2: Blends for Messages

Advertisement
“Join the Philosophy Dept’s Holiday Celebration”

Concept Pair:
Philosophy + Christmas
Study 2: Blends for Messages

News
“Football linked to lasting brain damage.”

Concept Pair:
Football + Dangerous

Football Linked to Lasting Brain Damage
DALLAS, Tex. – Reports show and increasing number of retired NFL players who have suffered concussions have developed cognitive issues
An Interactive Pipeline for Creating Visual Blends

Visual blends are images that help convey a message.

The pipeline decomposes the iterative design process into independent microtasks.
Why do we need to iterate in the design process?
Lego + Valentine’s Day
Brainstorm associations

Find Images of objects

Annotate shapes

Annotate shape coverage

Shape covers All of object

Blend

Evaluate

✅ Are both objects identifiable?

❌ Are two objects integrated into one object?

Lego

Valentine’s Day
Brainstorm associations

Find Images of objects

Annotate shapes

Annotate shape coverage

Shape covers All of object

Shape covers Part of object

Blend

Evaluate

Are both objects identifiable?

Are two objects integrated into one object?
Football + Dangerous
Brainstorm
associations

Find Images
of objects

Annotate
shapes

Annotate
shape coverage

Blend

Evaluate

Are both objects identifiable?

Are two objects integrated into one object?
Brainstorm
associations

Find Images
of objects

Annotate
shapes

Annotate
shape coverage

Football

Shape covers All of object

Dangerous

Shape covers Part of object

Blend

Evaluate
Are both objects identifiable?
Are two objects integrated into one object?
NYC + Healthy
NYC

Brainstorm associations

Find Images of objects

Annotate shapes

Annotate shape coverage

Healthy

No shape matches
NYC

**Brainstorm associations**

**Find Images of objects**

**Annotate shapes**

**Annotate shape coverage**

**Blend**

**Evaluate**

- Are both objects identifiable?
- Are two objects integrated into one object?

Healthy
Lego + Healthy
Brainstorm associations

Find Images of objects

Annotate shapes

Annotate shape coverage

Blend

Evaluate

No shape matches
Brainstorm associations

Find Images of objects

Annotate shapes

Annotate shape coverage

Blend

Evaluate

Are both objects identifiable?
Are two objects integrated into one object?
Orange + Healthy
Brainstorm associations

Find Images of objects

Annotate shapes

Annotate shape coverage

Shape covers Part of object

Shape covers All of object

Blend

Evaluate

Are both objects identifiable?

Are two objects integrated into one object?
**Orange**

- **Brainstorm associations**
- **Find Images of objects**
- **Annotate shapes**
- **Annotate shape coverage**

**Healthy**

- **Exercise equipment**

**Shape covers All of object**

**Shape covers Part of object**
Orange

Brainstorm associations

Find Images of objects

Annotate shapes

Annotate shape coverage

Shape covers All of object

Healthy

Exercise equipment

Blend

Evaluate

✔ Are both objects identifiable?

✔ Are two objects integrated into one object?
When do we need to iterate?

**Improve object fit**

- Within same search space, meet other constraints.
  - Find versions of an object with different color, style, aspect ratio

**No matches**

- Focus on meeting a specific constraint:
  - Find symbols with a different shape

**Objects are not identifiable**

- Search in a new subspace
  - Find symbols with a different shape
Summary

Iterative Design Process

- Requirements analysis
- Preliminary and detailed design
- Implementation
- Evaluation
Design involves risks

- Requirements
- Design
- Implement
- Fix bugs
- Create unboxing experience
- Done!

What if a touch screen can’t be implemented?

What if this device is so slow it’s unusable?

How can we keep up with the competition?
Mitigate risk by iteratively prototyping the riskiest elements

- **Requirements**
- **Design**
- **Implement**
- **Fix bugs**
- **Create unboxing experience**

What if a touch screen can’t be implemented?
What if this device is so slow it’s unusable?
How can we keep up with the competition?

Iterative Design Process:
- Requirements analysis
- Preliminary and detailed design
- Implementation
- Evaluation

Does touch work?
How to get perfect gradients?

What if this device is so slow it’s unusable?
What if a touch screen can’t be implemented?
How can we keep up with the competition?
Although the iterative design process is vague, it does work, and researchers are making the process more concrete.

Visual blends are images that help convey a message.

The pipeline decomposes the iterative design process into independent microtasks.
Iterative Design is best taught by practice.

Goals
1. Master front-end and back-end technologies for making interactive websites.
2. Discover specific user needs by developing a low-level, mechanical model of human behavior.
3. Practice iterative design to meet specific user needs.

INSTRUCTOR
Prof. Lydia Chilton
OH: Tuesdays 4-5, ECEPSR 612

Please contact staff through Piazza only

TAS
Katy Gero
OH: Wed 2:30-3:30, ECEPSR 603
Savvas Petridis
OH: TBA, CS OH room

TEACHING METHOD
This is a studio style class in the tradition of art and architecture. Students are expected to already know the fundamental techniques. We will practice these techniques as well as give and receive critique on a weekly basis. Attendance is mandatory.

Any absence, excused or otherwise, must be made up

WEEKLY SCHEDULE
Lecture
Friday 2:10-4pm in Mudd 337 (also known as the Engineering Terrace)