PAPER PROTOTYPING
Phew...
HCI @ Superbowl
Phew...

Jan 26
WEEK 4
Maya Office Hour
1:30 - 2:30
CSE 542

Jan 27
Design principles
10:30 - 11:50
EEB 045
2e - Task Review

Jan 28

Jan 29
Human Performance
10:30 - 11:50
EEB 045

Jan 30
Sections
10:30 - 11:20
MGH 287
1:30 - 2:20
MGH 254
2f - Design Check-in

Feb 2
Reading1: Research Paper
Maya Office Hour
1:30 - 2:30
CSE 542

Feb 3
Paper prototyping
10:30 - 11:50
EEB 045
2g - Getting the Right Design Report

Feb 4

Feb 5
Presentations
10:30 - 11:50
EEB 045

Feb 6
Presentations
10:30 - 11:20
MGH 287
1:30 - 2:20
MGH 254
Phew...

going the right design  getting the design right
Phew...

getting the right design

getting the design right
Phew...

getting the right design  getting the design right
Today

• Recap human abilities [20min]
  – Cover Fitt’s Law

• Paper prototyping [55min]
  – Description and guidelines [25min]
  – Exercise [30min]
HUMAN ABILITIES
...and their implications for design
Human abilities

• Humans:
  – Perception
    • Color
    • Patterns (Gestalt principles)
  – Memory
  – Motor
    • Movement speed/precision (Fitt’s law)

Every artifact is the way it is because of human morphology or physiology.
Color sensitivity

not as sensitive to blue!
Color sensitivity

• Not distributed evenly
  – mainly reds (64%) & very few blues (4%)

• No blue cones in retina center
  – “disappearance” of small blue objects you fixate on
Color sensitivity

• Not distributed evenly
  – mainly reds (64%) & very few blues (4%)

• No blue cones in retina center
  – “disappearance” of small blue objects you fixate on

Design implication:
don’t rely on blue for text or small objects
Focus

• Different wavelengths of light focused at different distances behind eye’s lens
  –need for constant refocusing causes fatigue

• Pure (saturated) colors require more focusing then less pure (desaturated)
Focus

• Different wavelengths of light focused at different distances behind eye’s lens
  – need for constant refocusing causes fatigue
• Pure (saturated) colors require more focusing than less pure (desaturated)

**Design implication:**

be careful about color combinations
don’t use saturated colors in UIs unless you really need something to stand out (stop sign)
Color guidelines

The Falklands Society
Color guidelines
Color guidelines

• Inherent meaning or feeling associated with colors
  – companies exploit it
Color guidelines

• The color wheel
Color harmony

© Jill Morton - Color Matters

© Jill Morton - Color Matters
Attention/saliency
Attention/saliency
Patterns
Gestalt principles - proximity

Elements that are **closer together are perceived to be more related** than elements that are farther apart.
Gestalt principles - similarity

Elements are **similar** are perceived to be more related than elements that are dissimilar.
Gestalt principles - good continuation

Elements arranged in a **straight line or a smooth curve** are perceived as a group and are interpreted as being more related than elements not on the line or curve.
Gestalt principles - closure

A tendency to perceive a **set of individual elements as a single, recognizable pattern**, rather than **multiple, individual elements**.
Memory

• Working memory (short term)
  – small capacity (7 ± 2 “chunks”)
Memory

• Access time
Memory

Recall
   reproduce information from memory
Recognition
   discriminate among provided info
Human motor movements

• Task:
  – Quickly tap each target 50 times accurately

• Conditions:
  – Two ½” diameter targets 6” apart
  – Two ½” diameter targets 24” apart
  – Two 2” diameter targets 24” apart
  – Two 2” diameter targets 24” apart (no accuracy required)
Human motor movements

30 sec

48 sec

31 sec

21 sec (lots of spread)
Fitt’s law

• To move the hand/mouse to target size $S$ which is distance $D$ away is given by:
  $$T = a + b \log_2 (D/S + 1)$$

• $D/S$: relative precision
Fitt’s law
Fitt’s law

Which one is faster on average?

Pop-up Linear Menu

| Today   | Sunday | Monday | Tuesday | Wednesday | Thursday | Friday | Saturday |

Pop-up Pie Menu

Today
Sunday
Monday
Tuesday
Wednesday
Thursday
Friday
Saturday
Fitt’s law

Which one is faster on average?

<table>
<thead>
<tr>
<th>Today</th>
<th>Sunday</th>
<th>Monday</th>
<th>Tuesday</th>
<th>Wednesday</th>
<th>Thursday</th>
<th>Friday</th>
<th>Saturday</th>
</tr>
</thead>
</table>

Pop-up Linear Menu

Pop-up Pie Menu

bigger targets & less distance
Pop up pie menu
Human versus Robot Factors
Human versus Robot Factors
Human limitations

• We perceive what we expect
• Our Vision is Optimized to See Structure
• We Seek and Use Visual Structure
• Reading is Unnatural
• Our Color Vision is Limited
• Our Peripheral Vision is Poor
• Our Attention is Limited; Our Memory is Imperfect
• Limits on Attention, Shape, Thought and Action
• Recognition is Easy; Recall is Hard
• Learning from Experience and Performing Learned Actions are Easy; Problem Solving and Calculation are Hard
• Many Factors Affect Learning
• We Have Time Requirements
PAPER PROTOTYPING
Paper prototyping

• Back to kindergarden
  – Arts and craft
  – Make believe
Prototype fidelity

Fidelity

Digital mockups

Paper prototypes***

Storyboarding

Time
Prototype fidelity

Fidelity

... Digital mockups

Paper prototypes***

Storyboarding

Time
Example 1
Example 1
Example 2
Example 2
What to use?

- Paper: Large, heavy, white
- Index cards
- Post-its
- Tape, stick glue, correction tape
- Pens & markers (many colors & sizes)
- Overhead transparencies
- Scissors, X-Acto knives, etc.
What to make?

- cursors
- buttons
- drop down menus
- scroll menus
- text fields
- error messages
- cursors
Tricks
Tricks

• Photocopy repeated items
Tricks

- Photocopy repeated items
- 3D sketching for buttons
Tricks

• Photocopy repeated items
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• Use physical props (stick a paper on your smart phone)
Tricks

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• 3D sketching for buttons
• Use physical props (stick a paper on your smart phone)
• Use real size templates
Tricks

- Photocopy repeated items
- 3D sketching for buttons
- Use physical props (stick a paper on your smart phone)
- Use real size templates
- Scroll using a frame
Tricks

• Photocopy repeated items
• 3D sketching for buttons
• Use physical props (stick a paper on your smart phone)
• Use real size templates
• Scroll using a frame
• Transparencies for adding text
Tricks

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• Folding (hide/expand)
Tricks

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• Verbal help menu/tool tip
Tricks

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- Use physical props (stick a paper on your smart phone)
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- Verbal help menu/tool tip
- Use sounds (beep)
Tricks

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- User real images
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- Use familiar OS icons
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- User real images
- Use familiar OS icons

Invent your own tricks!
Example: Physical prop
Example: Scrolling, use of real imagery
Time limit

• Important! Just as in storyboards
Testing a prototype

- Prepare test scenarios
- Practice
- Lay out or order pieces
Problems with lo-fi prototypes
Problems with lo-fi prototypes

• “Computer” is inherently buggy
• Slow compared to real app
  – timings not accurate
• Hard to implement some functionality
  – pulldowns, feedback, drag, visualizations
• Won’t look like final product
  – sometimes hard to recognize widgets
• End-users can’t use by themselves
  – not in their actual context of use
Exercise

• Build a paper prototype for an alarm clock
• Support the following tasks:
  – Setting the clock time
  – Setting up an alarm
  – Snoozing (when the alarm goes off)
  – Turning the alarm off