Individual Programming Assignment 2

Due Fri 2/14

Image Paint
(Turn in code + video)
Contextual Inquiry and Task Analysis

Due Feb 26

Find and interview 3 target users (not from class)
Pictures of observation/interview locations
Analyze their tasks
Explain how your application addresses their needs
Compare to five closest existing applications
(both mobile applications and other solutions)
See wiki for details

Start now!
Finding participants will take time
We will not accept late group project assignments
New Assignment: Heuristic Evaluation

Due on Friday 2/21

Individual assignment
Choose an smartphone application, conduct a heuristic evaluation of its interface
The term **affordance** refers to the **relationship** between the **properties of a physical object** and the **capabilities of a person**, that determine **how the object could be used**.

**Examples**
- Chair affords sitting
- Chair affords lifting (only if person is strong)
- Knobs afford turning
- Buttons afford pushing
- Glass affords seeing through
- Glass affords breaking

**Affordance not just property of object**
**Signifiers** help people figure out the affordances of objects without labels or instructions

What are the signifiers?
Chair affords sitting *(flat surface held by legs)*
Chair affords lifting *(size, materials)*
Knobs afford turning *(round shape)*
Buttons afford pushing *(cancave shape)*
Glass affords seeing through *(transparency)*
Glass affords breaking *(not visible)*
Conceptual Models

Designers model may not match user’s model

Users get model from experience & usage

Users only work with system image, not with designer

What if the two models don’t match?
Design Principles
1. Make Controls Visible
2. Make Sure Mapping is Clear

**Mapping:** Relationship between controls and their result

Mercedes S500 Car Seat Controller
Stovetop Controls

- **arbitrary**: 24 possibilities, requires: visible labels, memory
- **paired**: 2 possibilities per side, =4 total possibilities
- **full mapping**:
Transfer Expectations

From known objects to similar new ones

Positive: previous experience applies to new situation
Negative: previous experience conflicts with new situation
What happens when disk is dragged onto trash can?
3. Provide Feedback

People press >> 1 time
Unclear if system has registered the button press
Elevator buttons light up → reduces multiple presses

(cc) Flickr user iseethelight
Poor Feedback

Took a day for refrigerator to adjust to new settings
Conceptual Models

Design Model

System Image

User’s Model
Gulfs of Execution & Evaluation

Mental Model

Real World
Gulf of Evaluation

Real world:

<table>
<thead>
<tr>
<th>x</th>
<th>y</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.67</td>
<td>0.79</td>
</tr>
<tr>
<td>0.32</td>
<td>0.63</td>
</tr>
<tr>
<td>0.39</td>
<td>0.72</td>
</tr>
<tr>
<td>0.27</td>
<td>0.85</td>
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<tr>
<td>0.71</td>
<td>0.43</td>
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<tr>
<td>0.63</td>
<td>0.09</td>
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<tr>
<td>0.03</td>
<td>0.03</td>
</tr>
<tr>
<td>0.20</td>
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<tr>
<td>0.51</td>
<td>0.38</td>
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<tr>
<td>0.11</td>
<td>0.33</td>
</tr>
<tr>
<td>0.46</td>
<td>0.46</td>
</tr>
</tbody>
</table>

Mental model: x,y correlated?
Gulf of Evaluation

Real world:

Mental model: $x, y$ correlated?
Gulf of Evaluation

Real world:

\[ \rho = -0.29 \]

Mental model: x,y correlated?
Gulf of Execution

Real world

Mental model: Draw a rectangle

Gulf

Execution

Move 90 30
Rotate 35
Pen down

…
Gulf of Execution

Real world
1. Draw a rectangle
2. Rotate the shape

Mental model: Draw a rectangle
Gulf of Execution

Real world

Gulf

Mental model:
Draw a rectangle

Execution
Gulfs of Execution & Evaluation

Mental Model

Real World
Action Cycle

Goals

Execution

Evaluation

The World

START HERE
Action Cycle

Goals

Execution
- Intention to act
- Sequence of actions
- Execution of actions

Evaluation
- Evaluation of interpretations
- Interpreting the perception
- Perceiving the state of the world

The World

START HERE
Direct Manipulation
Direct Manipulation

An interface that behaves as though the interaction was with a real-world object rather than with an abstract system

Central ideas

1. Visibility of the objects of interest
2. Rapid, reversible, incremental actions
3. Manipulation by pointing and moving
4. Immediate and continuous display of results
Reduce Distance

Decrease gulfs
Semantic & Articulatory Distance

Semantic
Semantic distance reflects the relationship between the user’s intentions and the meaning of expressions in the interface languages.

Articulatory
Articulatory distance reflects the relationship between the physical form of an expression in the interaction language and its meaning.
Semantic & Articulatory Distance

Semantic
Is it possible to say what one wants to say?
Does the interaction match the user’s conceptual model?

Articulatory
Is form of expression similar to meaning of expression?
The Gulfs & **Semantic Distance**

**Gulf of Execution**
Match description level of interface language to level at which person thinks of the task (often interface is much lower) – (i.e. goal: draw star – draw star vs. draw pixels forming star)

**Gulf of Evaluation**
Match output to the user’s mental model to enable checking that goals have been met – (i.e. goal: get mean of set of numbers – present table of values vs. present mean)
The Gulfs & Articulatory Distance

Gulf of Execution
How similar is the interaction to the desired goal (i.e. move pointer with mouse, pointing with finger, lightpen, …)

Gulf of Evaluation
Depict output so that relationships between input action and output is obvious and easy to perceive (i.e. graphical chart vs. table of numbers)
Turtle.Move(150)
Turtle.Turn(90)
Turtle.Move(150)
Turtle.MoveTo(50, 200)
Turtle.Angle = 45
Autocomplete:
Which Gulf? Which Distance?
Win or lose, it was a great game.
Win or lose, it were a great game.
Win or loose, it was a great game.
Metaphor in User Interfaces
Metaphor

**Definition**
The transference of the relation between one set of objects to another set for the purpose of brief explanation

**Lakoff & Johnson**
“...the way we think, what we experience, and what we do every day is very much a matter of metaphor."

in our language & thinking - “argument is war”

…he attacked every weak point
... criticisms right on target
... if you use that strategy

Metaphors can highlight some features, suppress others

There is some systematicity to the transference
Interface Metaphors

Purpose
Leverages knowledge of familiar, concrete objects/experiences
Transfer this knowledge to abstract tasks and concepts

Problem
Inaccurate or naive conceptual model of the system

A presentation tool is like an slide projector
The Painting Metaphor
The Desktop Metaphor

**Started at Xerox PARC**

Xerox Star
Bitmapped screens made it possible

**Not meant to be a real desktop**

Organize information the way people use information on desktop
Allow windows to overlap – make screen act as if objects are on it
3D Desktops

[Robertson 2000] Sun’s Looking Glass
Google Art Project

http://www.googleartproject.com/museums/moma
Virtual Assistant Metaphor

http://www.technobuffalo.com/wp-content/uploads/2012/05/Apple-Siri.jpg
Metaphor Caveats

Too limited
The metaphor restricts interface possibilities

Too powerful
The metaphor implies the system can do things it can’t

Too literal or cute
Makes it difficult to understand abstract concept

Mismatched
The metaphor conveys the wrong meaning
Mismatched Metaphors

What is being controlled here?
Mismatched Metaphors

anti-pattern
Guidelines for Design

**Good Metaphors**
Capture essential elements of the event / world
Deliberately leave out / mute the irrelevant
Appropriate for user, task, and interpretation
Cognition

Jef Raskin
Cognitive Engineering

**Ergonomics:**
Accounts for statistical variation of human variability
Design a car seat that fits 95% of the population
Says that designing products that interact with us physically is reasonable straightforward

**Cognetics: Ergonomics of the mind**
Study of the “engineering scope of our mental abilities”
This is the applied side of cognitive science
Cognitive Conscious / Unconscious

**Examples?**

What is the last letter in your first name?
You know it but weren’t consciously accessing this information a moment ago, but now you are.

How do your shoes feel right now?
How did “The Shining” make you feel?
Having a name on the “tip of your tongue”
Locus of Attention

What is it?
An idea/object/event about which you are intently and actively thinking
The one entity on which you are currently concentrating
You see and hear much more
E.g., background noise

Why locus?
Focus implies volition; locus not always consciously control
Attention can be either active or “going with the flow”
Locus of Attention

Why is it important for HCI?
Cannot be conscious of more than one task at a time

Make the task the locus of attention

Beware of the power of mental habits
Repetitive confirmations don’t work

Take advantage of it
Do pre-loading while user thinking about next step
Streamline resumption of interrupted tasks
Modes