CS160: User Interface Design

Conceptual Models II 2/08/12

Due Monday Feb 13

Individual Prog. Assignment 2
(Source code, executable and video on wiki)
Contextual Inquiry and Task Analysis

Due Feb 22
Find and interview 3 target users (not from class)
Analyze their tasks
Explain how your application addresses their needs
Compare to five closest existing applications
See wiki for details

Start now!
Finding participants will take time
We will not accept late group project assignments

“… the term **affordance** refers to the **perceived** and **actual** properties of the thing, primarily those fundamental properties that determine just how the thing could possibly be used.

Some affordances obvious
Knobs afford turning
Buttons afford pushing
Glass can be seen through

Some affordances learned
Glass breaks easily

The Design of Everyday Things.
Don Norman
Review 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
Primary controls are visible
But how to set a radio station preset?

Too Much Visibility?

6 remote controls for “modest” home theater
2. Make Sure Mapping is Clear

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

Mercedes S500 Car Seat Controller
Does it control moving sound left/right or front/back?
Stovetop Controls

2 possibilities per side = 4 total possibilities

arbitrary

paired

full mapping

24 possibilities, requires: visible labels memory

2 possibilities per side = 4 total possibilities

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 → reducing multiple presses

Poor Feedback

Took a day for refrigerator to adjust to new settings
The Action Cycle

Conceptual Models

- Design Model
- User's Model
- System Image
Gulfs of Execution & Evaluation

Real World

Gulf of Evaluation

Real world:

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</table>

Mental model:

x, y correlated?

Evaluation
Gulf of Evaluation

Real world:

\[ \rho = -.29 \]

Mental model:

x,y correlated?

Gulf of Evaluation

Real world:

Mental model:

x,y correlated?
Gulf of Execution

Real world

Mental model: Draw a rectangle

Move 90 30
Rotate 35
Pen down
...

1. Draw a rectangle
2. Rotate the shape
Gulf of Execution

Real world | Execution | Mental model: Draw a rectangle

Conceptual Models

Design Model | User's Model | System Image
Direct Manipulation and Metaphors

Direct Manipulation

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

Central ideas
Visibility of the objects of interest
Rapid, reversible, incremental actions
Manipulation by pointing and moving
Immediate and continuous display of results

Almost always based on a metaphor
Mapped onto some facet of the real world task semantics
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

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
Microsoft Bob’s Desktop Metaphor

Bob’s “Living Room” Metaphor
3D Desktops

[Robertson 2000] Sun's Looking Glass

Google Art Project

http://www.googleartproject.com/museums/moma
A Different Metaphor

[Hartmann 2009]

Metaphor Caveats
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?*
Misused Metaphors

Direct translations
Software CD player that requires turning volume knob with mouse
Software telephony solution that requires the user to dial a number by clicking on a simulated keypad
Airline web site that simulates a ticket counter!

Guidelines for Design

Good Metaphors
Capture essential elements of the event / world
Deliberately leave out / mute the irrelevant
Appropriate for user, task, and interpretation
What about Abstract Operations?

**Metaphors are ill-suited for abstract operations**

Spell-checker?
Search database by scrolling or by query?

**Solution:** Combine direct manipulation & abstractions

**Word processor:**
- WYSIWYG document (direct manipulation)
- Buttons, menus, dialog boxes (abstractions, but direct manipulation “in the small”)

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

Modes: Definition

The same user actions have different effects in different situations.
Examples?
Modes: Examples
Using Modes in Interfaces

When are they useful?
Temporarily restrict users' actions
When logical and clearly visible and easily switchable
Drawing with paintbrush vs. pencil

Why can they be problematic?
Big memory burden
Source of many serious errors

How can these problems be fixed?
Don't use modes – redesign system to be modeless
Redundantly visible
Redesigning to Avoid Modes

Setting the time on a clock

Modal

Redesigning to Avoid Modes

Setting the time on a clock

Modeless
Quasimodes

Set and hold a mode via conscious, continuous action
Shift key to capitalize (vs. Caps Lock)
Foot pedal that must remain pressed
Pull down menus
Muscle tension reminds users they are holding a mode

Also known as “spring-loaded modes”

Noun-Verb VS Verb-Noun

Noun-Verb: Select object, then do action
Emphasizes 'nouns' (visible objects) rather than 'verbs' (actions)

Advantages
Closer to real world
Modeless interaction
Actions always within context of object
inappropriate ones can be hidden
Generic commands
the same type of action can be performed on the object
e.g. drag ‘n’ drop:
## Summary

**Metaphor**  
Leverages knowledge of familiar objects & experiences  
Transfer this knowledge to abstract tasks and concepts  
Easily mismatched or misused so be careful!

**Cognition (Jef Raskin)**  
Locus of attention – where you consciously attend

**Modes**  
Can create memory issues and cause serious errors  
Avoid modes in your designs!