Conceptual Models & Interface Metaphors

刘哲明
Prof. James A. Landay
Computer Science Department
Stanford University

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Hall of Fame or Shame?

• Design based on a top retailer’s site
Hall of Shame!

- Design based on a top retailer’s site
- Color deficiency
  - can’t distinguish between red & green
- In study, user could not get by this screen!
- How to fix?
  - redundant cues
1. Instructions at the top for all errors
2. Redundant exclamation icons
3. Changed color on boxes around input fields with errors
4. Instructions on what to fix near each error
Outline

- *Design of Everyday Things*
- Conceptual models
- Team break
- Design guides for conceptual models
- Interface metaphors
- UI consistency
Design of Everyday Things

• By Don Norman
  – UCSD, Apple, HP, NN Group, NU, UCSD

• Design of everyday objects illustrates problems faced by designers of systems

• Explains conceptual models
  – doors, washing machines, digital watches, phones

• Resulting design guides

→ Highly recommended
Conceptual Model?

Def. *Mental representation of how an artifact works & how interface controls affect it*

- People may have preconceived models that are hard to change
  - (4 + 5) vs. (4 5 +) on a calculator
  - dragging to trash?
    - deletes file but ejects disk

- Interface must communicate model
  - visually, possibly physically or using sound
Well-designed objects have affordances
- clues to their operation
- often visual, but not always (e.g., speech)

Affordances as Perceptual Clues

Gibson: “actionable possibilities”
Affordances as Perceptual Clues

Poorly-designed objects
- no clues or misleading clues

Jacques Carelman, *Catalogue d’Objets Introuvables*
Crazy design for a screw punch!
Affordances as Perceptual Clues

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Affordances as Perceptual Clues

Poorly-designed objects
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http://alistapart.com/article/flat-ui-and-forms
Refrigerator

Problem: freezer too cold, but fresh food just right
Refrigerator Controls

Normal Settings  C and 5
Colder Fresh Food C and 6-7
Coldest Fresh Food B and 8-9
Colder Freezer D and 7-8
Warmer Fresh Food C and 4-1
OFF (both) 0

What is your conceptual model?
Spend 60 sec. drawing a diagram showing your model
– where the cooling units are & how they are controlled
Share with your neighbor & put a picture in the slack channel
A Common Conceptual Model

independent cooling units
Actual Conceptual Model

Can you fix the problem?

Possible solutions
- make controls map to customer’s model
- make controls map to actual system
Design Model & Customer Model

- Customers get model from prior experience & usage of new
  - through system image
- What if the two models don’t match?
Conceptual Model Mismatch

• Mismatch between designer’s & customer’s conceptual models leads to...
  - slow performance
  - errors
  - frustration
  - …
Model Mismatch: Car Automatic Shifter
Model Mismatch: Windows 10 Bluetooth

- Is Bluetooth on or off?
- Often switches show the state that sliding towards will execute

Example and images from https://www.nngroup.com/articles/two-ux-gulfs-evaluation-execution/
Model Mismatch: Windows 10 Bluetooth

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- Is Bluetooth on or off?
- Often switches show the state that sliding towards will execute
- We see how it works when we see several switches

Notifications

- Get notifications from apps and other senders
  - On
- Show notifications on the lock screen
  - On
- Show reminders and incoming VoIP calls on the lock screen
  - On
- Hide notifications when I’m duplicating my screen
  - Off
- Show me the Windows welcome experience after updates and occasionally when I sign in to highlight what’s new and suggested
  - On
- Get tips, tricks, and suggestions as you use Windows
  - On

Example and images from https://www.nngroup.com/articles/two-ux-gulfs-evaluation-execution/
Model Mismatch: Windows 10 Bluetooth

• Is Bluetooth on or off?
• Often switches show the state that sliding towards will execute
• We see how it works when we see several switches

The system state is **visible**, but we fail to **evaluate** the state correctly

Example and images from https://www.nngroup.com/articles/two-ux-gulfs-evaluation-execution/
Gulf of Evaluation & Gulf of Execution

*reduce the gulf* through design

- **Gulf of Evaluation**
  - What’s the current system state?

- **Gulf of Execution**
  - How do I use this system?

Example and images from https://www.nngroup.com/articles/two-ux-gulfs-evaluation-execution/
Gulf of Evaluation & Gulf of Execution

*reduce the gulf* through design

- Bluetooth & other devices
  - Add Bluetooth or other device
- Bluetooth: Off
- Mouse, keyboard, & pen
  - Dell KB216 Wired Keyboard

Example and images from https://www.nngroup.com/articles/two-ux-gulfs-evaluation-execution/
Administrivia

- Grading on Assignment #4: Concept Video
  - A4 Video Only:  
    - ✓: 0%  ✓ - : 0%  ✓ -: 0%  ✓ : 23%  ✓ + : 55%  ✓ ++ : 23%
  - A4 Slides Only:  
    - ✓: 0%  ✓ - : 0%  ✓ -: 3%  ✓ : 28%  ✓ + : 58%  ✓ ++ : 13%

- Questions about Medium-fi Prototype assignment?
  - both the Figma Basics & Design Systems workshops are now online. Check them out now for this & following assignments!

- Final workshop – Accessibility – will link to recording online
  - we will give a few bonus points for projects that do a good job of addressing accessibility
Administrivia

- If you aren’t in CS147L & want to learn React Native
  - see CS147 home page for links to CS147L assignments 1-4 & Lectures 1A-6B

- Keep up w/ readings/HW on class website
  - [http://cs147.stanford.edu/](http://cs147.stanford.edu/)
  - midterm coming up in week 8 (weeks 7-8 have lighter work)
Midterm

**Scope:** Everything through Usability Testing (Week 8 - Lecture 14) including Reading/Videos/Podcasts, Lectures, Assignments.

**Format:** Will primarily be a multi-part design problem (but know and be able to demonstrate *all* aspects of the design process & use facts for reasoning for your answers), with some multiple choice/short answer on knowledge of HCI as well.

**Place:** Hybrid exam – part I in class & part II (design problem) at home (Gradescope)

**Time:** This midterm will take place during a 24-hour window starting in class Wed., Nov. 15, at 1:30 pm Pacific time. You will have ~1:30 for part I in class and ~2 hour for part II at home.
TEAM BREAK

Talk about how to build your medium-fi prototype
Design Guides

- Provide good conceptual model
  - customer wants to understand how controls affect object

- Make things visible
  - if object has function, interface should show it

- Map interface controls to customer’s model
  - infix vs. postfix calculator – whose model is that?

- Provide feedback
  - what you see is what you get! (WYSIWYG)
Make Things Visible

• Refrigerator?
  - make the 1..9 dial something about percentage of cooling between the two compartments?

• Functions available on watch w/ 4 buttons? Is there an issue?
  - too many & they are not visible!
Make Things Visible

• Compare to controls on old & new car radios
  - #controls = #functions
  - controls are labeled (mostly) and grouped together
Make Things Visible

- Compare to controls on old & new car radios
  - #controls = #functions
  - controls are labeled (?) and grouped together
Make Things Visible

- Compare to controls on old & new car radios
  - #controls = #functions
  - controls are labeled (?) and grouped together
  - tradeoffs of the “glass UI” (e.g., Tesla)
Map Interface Controls to Customer’s Model

- Which is better for car dashboard speaker front / back control?
- Control should *mirror real-world*
Map Interface Controls to Customer’s Model

- Which is better for car dashboard speaker front / back control?
- Control should *mirror real-world*

Mercedes Benz Seat Control maps to real world
Map Interface Controls to Customer’s Model

Problem?

Which knob controls which burner?
Map Interface Controls to Customer’s Model

Possible fixes?
Metaphor

- Definition?
  “The transference of the relation between one set of objects to another set for the purpose of brief explanation.”

- Lakoff & Johnson, *Metaphors We Live By*
  - “...the way we think, what we experience, and what we do everyday 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

- We use metaphor in UI design to *leverage existing conceptual models*
Engelbart’s windows

In today’s Emacs
Desktop Metaphor

Suggests a conceptual model
- not really an attempt to simulate a real desktop
- a way to explain why some windows overlapped
- leverages knowledge about files, folders & trash

Leap!

Xerox PARC’s overlapping windows
Example Metaphors

- Global metaphors
  - personal assistant, wallet, clothing, cards
- Data & function
  - to-do list, calendar, documents, find, assist
- Collections
  - drawers, files, books, newspapers, photo albums
How to Use Metaphor

• Develop interface metaphor tied to conceptual model

• Communicate that metaphor to the user

• Provide high-level task-oriented operations, not low-level implementation commands
Avoid Metaphor for Metaphor’s Sake

• Skeuomorphism
  – “making items resemble their real-world counterparts” or
  “a physical ornament or design on an object made to resemble another material or technique”

• Argument against: takes up space & leads to inconsistent look

• Argument for: helps people learn
Avoid Metaphor for Metaphor’s Sake

• Metaphors can become dated

iPhone metaphors dated?

iPad Podcast app – ever seen a reel-to-reel tape deck?
Ways of Being Consistent

• Interfaces should be consistent in a meaningful way
  – e.g., ubiquitous use of same keys for cut/copy/paste
  – H4: Consistency & Standards

• Types of consistency
  – consistent internally
    • e.g., same terminology & layout throughout app
  – consistent with other apps
    • e.g., works like MS Word, uses same keyboard conventions
    • design patterns (across many apps)
  – consistent with physical world
Is Consistent Always Better?  NO

• Palm PDA example: should “new appointment” & “delete appointment” be in the same place?
• New (add) is common, but delete is not
Is Consistent Always Better?  NO

Early Palm design (like desktop version)  Streamlined design
Is Consistent Always Better?  NO

Firefox 3 Back/Forward Buttons
Is Consistent Always Better? NO

More Recent Firefox Back/Forward Buttons
Summary

• Conceptual model?
  - mental representation of how the object works & how interface controls effect it

• Design model should equal customer’s model?
  - mismatches lead to errors
  - use customer’s likely conceptual model to design

• Design guides?
  - provide good conceptual model
  - make things visible
  - map interface controls to customer’s model
  - provide feedback
Further Reading

- *Design of Everyday Things*, Donald Norman

- Design as Practiced, Donald Norman
  - Talks about failure to make changes to Macintosh

- Computing the Case Against User Interface Consistency, Jonathan Grudin
  - Talks about why interfaces should not always be consistent
  - [https://www.semanticscholar.org/paper/The-Case-Against-User-Interface-Consistency-for-can-Jonathan-Grudin/71cc342910a4add7ee522c5510769a1c51df2ebd](https://www.semanticscholar.org/paper/The-Case-Against-User-Interface-Consistency-for-can-Jonathan-Grudin/71cc342910a4add7ee522c5510769a1c51df2ebd)
Next Time

• Lecture
  – Heuristic Evaluation (w/ in-class exercise)

• Read
  – How to Conduct a Heuristic Evaluation by Jakob Nielsen

• Studio
  – This week: Half-way review w/ outside experts