Conceptual Models & Interface Metaphors

Prof. James A. Landay
Computer Science Department
Stanford University
Autumn 2014
October 23, 2014

Interface Hall of Fame!

Good
- shape indicates function
- so simple that instructions fit in 1 image
- fun!

Bad
- dripping water?
- too much noise
- still takes too long

Dyson AirBlade hand dryer
example courtesy of Maya I.

Interface Hall of Shame!

- Tabbed dialog for setting options in MS Web Studio
  - more tabs than space to display them
  - Clicking on the right arrow once gives

  Options
  - Editor | Tabs | Debug | Compatibility | Directories | Workspace | Print

- Inconsistent display of possible tabs
  - where did the “Editor” tab go?
  - Position of arrows awkward (split to each side?)
  - also, small targets near each other (Fitts’ Law)

Conceptual Models & Interface Metaphors

Prof. James A. Landay
Computer Science Department
Stanford University
Autumn 2014
October 23, 2014
Outline

- Mid-quarter Evaluation Summary/Response
- Review
- Design of Everyday Things
- Conceptual models
- Team Break
- Interface metaphors
- UI Consistency

Mid-quarter Evaluation Summary/Response

Things to improve
1) Assignments very fast paced, course load heavy (unlike prior quarters), & feedback not coming back quickly enough
2) Lectures could be shorter given the content
3) Students are struggling to get group work done in such a compressed timeline
4) Assignment instructions / grading unclear or inconsistent
5) Students want more control over projects

Things to improve
1) Assignments very fast paced, course load heavy (unlike prior quarters), & feedback not coming back quickly enough
   The course IS fast paced & really doing this process is the only way to learn the material.
   Note: The work tapers in the last ½.
   BUT, we can make it less painful:
   • feedback will come every Friday from CAs
   • reduced writing on written assignments
   • get at least 2 project assignments online ahead

2) Lectures could be shorter given the content
3) Students are struggling to get group work done in such a compressed timeline
   We will start building in 25-30 minutes of group project time in the lecture break
   Will try to move up some of the “work on project” lectures (now 11/11, 11/20, 12/4).

4) Assignment instructions / grading unclear or inconsistent
   • Some felt instructions too long & others liked (try to make them as explicit as possible – will keep trying to improve)
   • CAs go over example assignments in group meeting to encourage consistency & also align grades after grading to make sure some aren’t harsher or easier than the group
   • BUT, this material is inherently subjective. There is NO right answer and grading will have ambiguity. So will your real world work!
Mid-quarter Evaluation Summary/Response

Things to improve

5) Students want more control over projects (e.g., picking teams, changing topics, kicking off people not doing their share…)
(folks were split on how teams were created)

• Pick teams for diversity as it leads to better design & this is authentic "working on a team" experience (course goal)
• Some teams did change topics early on & we approved it, but could have been more transparent about the process
• Team slackers: part of being a high performing team is communicating performance to teammates (exercise today) & contacting us if it doesn’t work–grades will reflect

Review of Early Stage Prototyping

• Prototypes are a ? – concrete representation of a design or final product
• High-fi prototypes may cause viewers to?
  – focus on low-level details (e.g., colors, fonts, & alignment) rather than high-level structure
• High-fi prototypes may cause designers to?
  1) spend too much time on details
  2) be less creative in exploring other ideas
• Low-fi testing allows us to quickly iterate
  – get user feedback & change right away
• Informal UI prototyping tools combine advantages of paper w/ electronic tools

Design of Everyday Things

• By Don Norman (UCSD, Apple, HP, NN Group, NU)
• Design of everyday objects illustrates problems faced by designers of systems
• Explains conceptual models
  – doors, washing machines, digital watches, telephones, …
• Resulting design guides
→ Highly recommended

Conceptual Models

• 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 +)
  – dragging to trash?
    • deletes file but ejects disk
• Interface must communicate model
  – visually (& possibly physically or using sound)
  – online help and documentation can help, but shouldn’t be necessary

Affordances as Perceptual Clues

• Well-designed objects have affordances
  – clues to their operation
  – often visual, but not always (e.g., speech)

Affordances as Perceptual Clues

• Poorly-designed objects
  – no clues or misleading clues

French artist Jacques Carelman
Crazy design for a screw punch!
Refrigerator

Problem: freezer too cold, but fresh food just right

Refrigerator Controls

What is your conceptual model?
Spend 30 sec. drawing a diagram showing your model
(where the cooling units are & how controlled)

A Common Conceptual Model

independent controls

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 experience & usage
  - 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
  - ...

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
Design Guides

- Provide good conceptual model
  - customer wants to understand how UI controls impact 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 A..E dial something about percentage of cooling between the two compartments?
- Controls available on watch w/ 3 buttons?
  - too many and they are not visible!
- Compare to controls on simple car radio
  - #controls = #functions
  - controls are labeled (?) and grouped together

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

Dashboard

1

2
Problem?

Which knob controls which burner?

Possible fixes?

Autumn 2014

HCI+D: User Interface Design, Prototyping, & Evaluation

Problem?

Which knob controls which burner?

Possible fixes?

Autumn 2014

HCI+D: User Interface Design, Prototyping, & Evaluation

Team Exercise

• What are your goals/deliverables?
• Are you on track to meet your team goals/deliverables?
• If no, why not? What can you change?

Autumn 2014

HCI+D: User Interface Design, Prototyping, & Evaluation

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 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

• We can use metaphor in interface design to leverage existing conceptual models

Autumn 2014

HCI+D: User Interface Design, Prototyping, & Evaluation

Desktop Metaphor

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

- **Global metaphors**
  - personal assistant, wallet, clothing, pens, cards, telephone, eyeglasses
- **Data & function**
  - rolodex, to-do list, calendar, applications 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

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

Ways of Being Consistent

- Interfaces should be consistent in a meaningful way
  - e.g., ubiquitous use of same keys for cut/copy/paste
- Types of consistency
  - consistent internally
    - e.g., same terminology and layout throughout app
  - consistent with other apps
    - e.g. works like MS Word, uses keyboard conventions
  - design patterns (across many apps)
  - consistent with physical world
Summary

- Conceptual models
  - 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
  - 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
  - http://www1.ics.uci.edu/~grudin/Papers/CACM89/CACM89.html

Next Time

- Visual Information Design
- “Readings”
  - Watch Scott Klemmer’s HCIOnline lectures
    - 6.1 Visual Design (7:37)
    - 6.2 Typography (10:47)
    - 6.3 Grids & Alignment (17:33)

- Next team assignment
  - Medium-fidelity Prototype
  - start to think about how idea fits on target platform (doesn’t have to be exact yet)
  - use a prototyping tool (we suggest three – ask to use another)
  - InVision
  - Marvel
  - proto.io
  - Let’s go over it now so it is clear

Interface Hall of Fame or Shame?

- Good
  - discoverable gestures
  - keeping things simple means gestures don’t cause unexpected problems
  - logical hierarchy of items
  - sounds & animations are pleasurable & beautiful – app is FUN

- Bad
  - does not have some features of major competitors (e.g., priorities)