Lecture 8:
Design Principles

Usability Guidelines ("Heuristics")

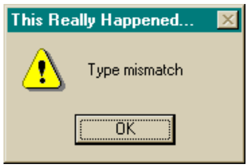
- Plenty to choose from
  - Nielsen's 10 principles
    - One version in his book
    - A more recent version on his website
  - Tognazzini's 16 principles
  - Norman's rules from Design of Everyday Things
  - Mac, Windows, Gnome, KDE guidelines
- Help designers choose design alternatives
- Help evaluators find problems in interfaces ("heuristic evaluation")

Guidelines From Earlier Lectures

- User-centered design
  - Know your users
  - Understand their tasks
- Fitts's Law
  - Size and proximity of controls should relate to their importance
  - Tiny controls are hard to hit
  - Screen edges are precious
- Memory
  - Use chunking to simplify information presentation
  - Minimize working memory
- Color guidelines
  - Don't depend solely on color distinctions (color blindness)
  - Avoid red on blue text (chromatic aberration)
  - Avoid small blue details
- Norman's principles of direct manipulation
  - Affordances
  - Natural mapping
  - Visibility
  - Feedback

1. Match the Real World

- Use common words, not techie jargon
  - But use domain-specific terms where appropriate
- Don't put limits on user-defined names
- Allow aliases/synonyms in command languages
- Metaphors are useful but may mislead

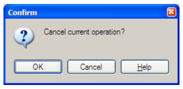


Type mismatch

Source: Interface Hall of Shame

2. Consistency and Standards

- Principle of Least Surprise
  - Similar things should look and act similar
  - Different things should look different
- Other properties
  - Size, location, color, wording, ordering, ...
- Command/argument order
  - Prefix vs. postfix
- Follow platform standards

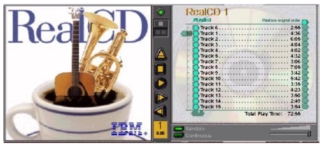


Cancel current operation?

Source: Interface Hall of Shame

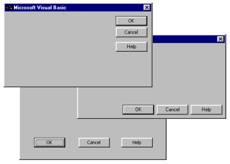
Kinds of Consistency

- Internal
- External
- Metaphorical



Track 6	2:55
Track 1	4:36
Track 2	6:05
Track 3	4:04
Track 4	4:02
Track 5	4:32
Track 7	3:06
Track 8	7:05
Track 9	3:42
Track 10	5:42
Track 11	3:35
Track 12	4:23
Track 13	3:50
Track 14	2:40
Track 15	3:54

Total Play Time: 72:55



Case Against Consistency (Grudin)

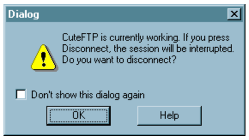
- Inconsistency is appropriate when context and task demand it
  - Arrow keys
- But if all else is (almost) equal, consistency wins
  - QWERTY vs. Dvorak
  - OK/Cancel button order

3. Help and Documentation

- Users don't read manuals
  - Prefer to spend time working toward their task goals, not learning about your system
- But manuals and online help are vital
  - Usually when user is frustrated or in crisis
- Help should be:
  - Searchable
  - Context-sensitive
  - Task-oriented
  - Concrete
  - Short

4. User Control and Freedom

- Provide undo
- Long operations should be cancelable
- All dialogs should have a cancel button



Dialog

CuteFTP is currently working. If you press Disconnect, the session will be interrupted. Do you want to disconnect?

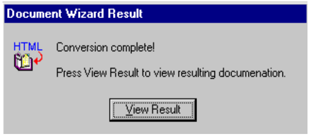
□ Don't show this dialog again

Source: Interface Hall of Shame

- User-provided data should be editable

5. Visibility of System Status (Feedback)

- Keep user informed of system state
  - Cursor change
  - Selection highlight
  - Status bar
  - Don't overdo it...



Document Wizard Result

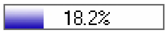
HTML

Conversion complete!

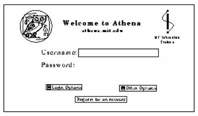
Press View Result to view resulting documenation.

Source: Interface Hall of Shame

- Response time
  - < 0.1 s: seems instantaneous
  - 0.1-1 s: user notices, but no feedback needed ⌛
  - 1-5 s: display busy cursor
  - > 1-5 s: display progress bar



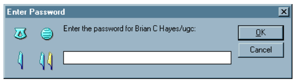
5. Visibility of System Status (Feedback)



Welcome to Athena
athena.mit.edu

MIT Information Systems

Username:
Password:

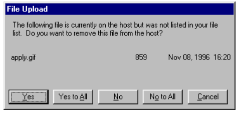


Enter Password

Enter the password for Brian C Hayes/ugc:

6. Flexibility and Efficiency (Shortcuts)

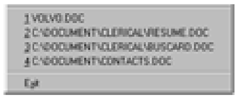
- Provide easily-learned shortcuts for frequent operations
  - Keyboard accelerators
  - Command abbreviations
  - Styles
  - Bookmarks
  - History



File Upload

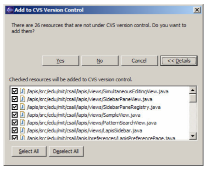
The following file is currently on the host but was not listed in your file list. Do you want to remove this file from the host?

apply.gif 859 Nov 08, 1996 16:20



1 VOLVO.DOC
2 C:\DOCUMENT\CLERICAL\RESUME.DOC
3 C:\DOCUMENT\CLERICAL\BUSCARD.DOC
4 C:\DOCUMENT\CONTACTS.DOC
Exit

Source: Interface Hall of Shame



Add to CVS Version Control

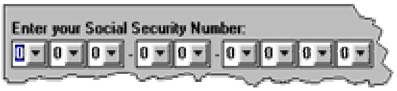
There are 26 resources that are not under CVS version control. Do you want to add them?

Checked resources will be added to CVS version control.

☑ /lapis/src/edu/mit/csail/lapis/views/SimultaneousEditingView.java
☑ /lapis/src/edu/mit/csail/lapis/views/SidebarPaneView.java
☑ /lapis/src/edu/mit/csail/lapis/views/SidebarPaneRegistry.java
☑ /lapis/src/edu/mit/csail/lapis/views/SampleView.java
☑ /lapis/src/edu/mit/csail/lapis/views/PatternSearchView.java
☑ /lapis/src/edu/mit/csail/lapis/views/LapisSidebar.java
☑ /lapis/src/edu/mit/csail/lapis/preferences/LapisPreferencePage.java

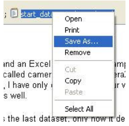
7. Error Prevention

- Selection is less error-prone than typing
  - But don’t go overboard...



Source: Interface Hall of Shame

- Disable illegal commands
- Keep dangerous commands away from common ones



Description Error

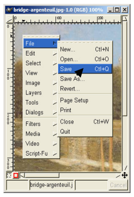
- Intended action is replaced by another action with many features in common
  - Pouring orange juice into your cereal
  - Putting the wrong lid on a bowl
  - Throwing shirt into toilet instead of hamper
  - Going to Kendall Square instead of Kenmore Square
- Avoid actions with very similar descriptions
  - Long rows of identical switches
  - Adjacent menu items that look similar

Capture Error

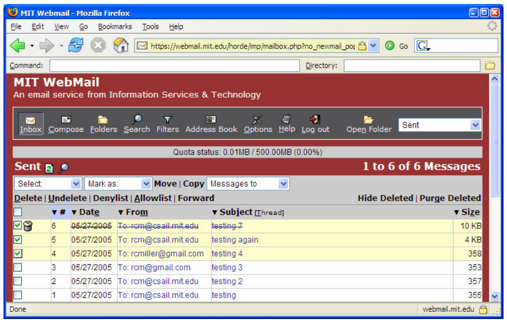
- A sequence of actions is replaced by another sequence that starts the same way
  - Leave your house and find yourself walking to school instead of where you meant to go
  - Vi :wq command
- Avoid habitual action sequences with common prefixes

Mode Error

- Modes: states in which actions have different meanings
  - Vi’s insert mode vs. command mode
  - Caps Lock
  - Drawing palette
- Avoiding mode errors
  - Eliminate modes
  - Visibility of mode
  - Spring-loaded or temporary modes
  - Disjoint action sets in different modes



More Mode Errors


MIT Webmail - Mozilla Firefox
File Edit View Go Bookmarks Tools Help
https://webmail.mit.edu/horde/imp/mailbox.php?no_newmail_po
Go
Command:
Directory:
MIT WebMail
An email service from Information Services & Technology
Inbox Compose Folders Search Filters Address Book Options Help Log out Open Folder
Sent
Select: Mark as: Move | Copy Messages to
Delete | Undelete | Denylist | Allowlist | Forward
Hide Deleted | Purge Deleted
Done
webmail.mit.edu

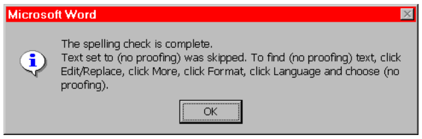
Quota status: 0.01MB / 500.00MB (0.00%)

Sent — 1 to 6 of 6 Messages

□	#	Date	From	Subject [Thread]	Size
☑	6	~~05/27/2005~~	~~To: rcm@csail.mit.edu~~	~~testing 7~~	10 KB
☑	5	05/27/2005	To: rcm@csail.mit.edu	testing again	4 KB
☑	4	05/27/2005	To: rcmiller@gmail.com	testing 4	358
□	3	05/27/2005	To: rcm@gmail.com	testing 3	353
□	2	05/27/2005	To: rcm@csail.mit.edu	testing 2	357
□	1	05/27/2005	To: rcm@csail.mit.edu	testing	355

8. Recognition, Not Recall (Memory Load)

- Use menus, not command languages
- Use combo boxes, not textboxes
- Use generic commands where possible (Open, Save, Copy Paste)
- All needed information should be visible

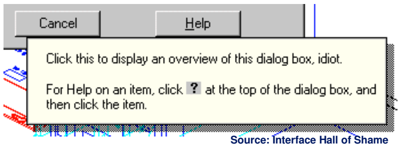


The spelling check is complete.
Text set to (no proofing) was skipped. To find (no proofing) text, click Edit/Replace, click More, click Format, click Language and choose (no proofing).

Source: Interface Hall of Shame

9. Error Reporting, Diagnosis, Recovery

- Be precise; restate user's input
  - Not "Cannot open file", but "Cannot open file named paper.doc"
- Give constructive help
  - why error occurred and how to fix it
- Be polite and nonblaming
  - Not "fatal error", not "illegal"
- Hide technical details (stack trace) until requested



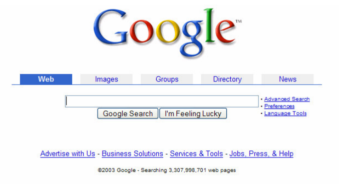
Click this to display an overview of this dialog box, idiot.

For Help on an item, click ? at the top of the dialog box, and then click the item.

Source: Interface Hall of Shame

10. Aesthetic and Minimalist Design

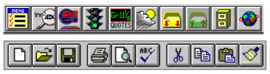
- "Less is More"
  - Omit extraneous info, graphics, features



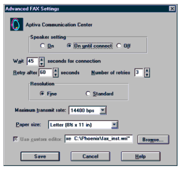
©2003 Google - Searching 3,307,998,701 web pages

10. Aesthetic and Minimalist Design

- Good graphic design
  - Few, well-chosen colors and fonts



  - Group with whitespace
  - Align controls sensibly
- Use concise language
  - Choose labels carefully



Advanced FAX Settings

Aptiva Communication Center

Speaker setting: ○ On ● On until connect ○ Off

Wait 45 seconds for connection

Retry after 60 seconds Number of retries 3

Resolution: ● Fine ○ Standard

Maximum transmit rate: 14400 bps

Paper size: Letter (8½ x 11 in)

☒ Use custom editor: xe C:\Phoenix\fax_inst.wri"

Source: Interface Hall of Shame

Chunking the Heuristics Further

- **Meet expectations**
  1. Match the real world
  2. Consistency & standards
  3. Help & documentation
- **User is the boss**
  4. User control & freedom
  5. Visibility of system status
  6. Flexibility & efficiency
- **Handle errors**
  7. Error prevention
  8. Recognition, not recall
  9. Error reporting, diagnosis, and recovery
- **Keep it simple**
  10. Aesthetic & minimalist design

Tog's 16 Principles

- **Anticipation**
- Autonomy
- Color blindness
- Consistency
- **Defaults**
- Efficiency
- **Explorable interfaces**
- Fitts's Law
- Human interface objects
- Latency reduction
- **Learnability**
- Metaphors
- **Protect users' work**
- **Readability**
- **Track state**
- **Visible navigation**

Shneiderman's 8 Golden Rules

- Consistency
- Shortcuts
- Feedback
- **Dialog closure**
- Simple error handling
- Reversible actions
- Put user in control
- Reduce short-term memory load