



Human-Computer Interaction IS4300

1



I5 *due next class*

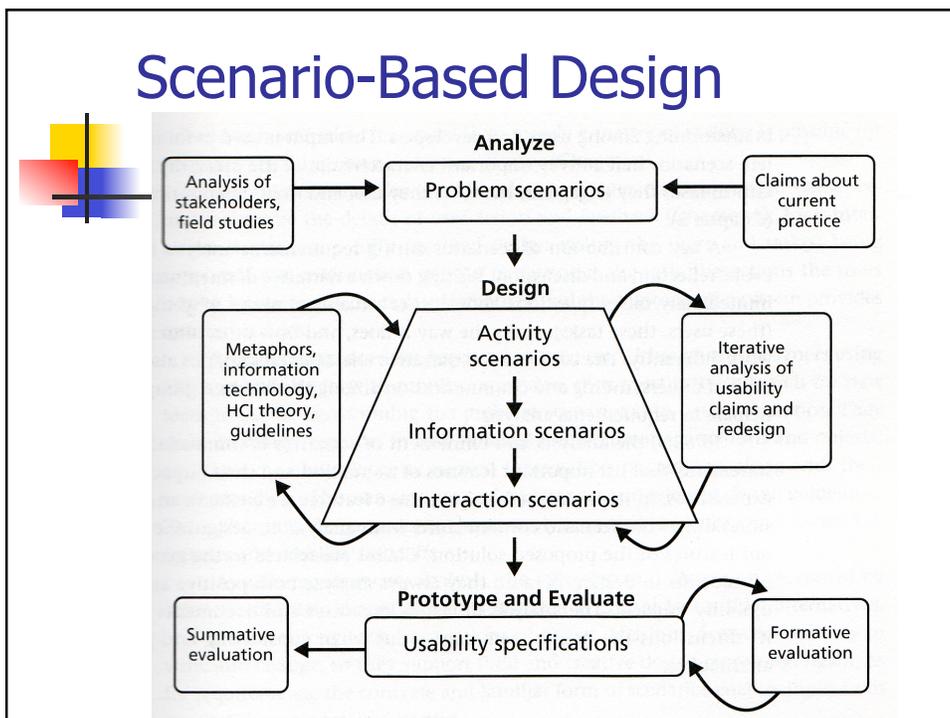
- Your mission in this exercise is to implement a very simple Java painting application. The app must support the following functions:
- Draw curves, specified by a mouse drag.
- Draw filled rectangles or ovals, specified by a mouse drag (don't worry about dynamically drawing the shape during the drag - just draw the final shape indicated).
- Shape selection (line, rectangle or oval) selected by a combo box OR menu.
- Color selection using radio buttons OR menu.
- Line thickness using a combo box OR menu.
- A CLEAR button.

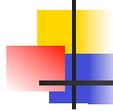
3

P3 – Conceptual Design

- Convert task scenarios and hierarchical task analyses into a conceptual design.
- Metaphors.
 - Make a list of possible interaction metaphors for your interface (per the examples in class). For each of your task scenarios list at least two options for interaction metaphors and some of the implications of your choice.
- Activity Design Scenarios
 - Transform each of your problem scenarios into an activity design scenario, following the examples in Rosson & Carroll Ch 3, Figures 3.4 and 3.5.
- *In design activities, you should also be considering many options and down-selecting.*

4





P4 – Moving to screen design

Given:

- Activity scenarios & Interaction Metaphors (due today)
- Task hierarchies
 - Visibility & Feedback requirements for each step
- Interaction scenarios

Now:

- Design main screens
- Storyboard task steps

6

Interaction Scenario

Mr. King can see that Sally is already there when he arrives: The Current Visitors list shows her name. When he arrives, his name is added and flashes briefly in red, so Sally notices him arrive and greets him with a chat message. He quickly notes that she has already added several new items—a title page (which is displayed by default in the main view) and a slide show. He selects her name in the Visitors list, and then uses Control+I to see what she is viewing. The miniature window titled Slide Show flashes in red, so he figures she must be working on her slides. Leaving her name selected in the list, he uses Control+F to synchronize his view with hers. His main viewing area updates to display the message, “Slide show being modified.” PowerPoint then opens to the side, positioned at the slide she is working on. Mr. King’s view of the slides is now controlled by Sally; when she moves to a new slide, so does he. He watches and makes suggestions as she refines the slides, using the text chat.

Sally tells Mr. King that several elements in the template are still empty, but that she has developed most of her material and is about to upload it. Because he is still synchronized with her, he is able to watch this process. She selects a template icon, then selects Get File from the Construction menu. A familiar file-browsing dialog box appears, and he watches as she selects the files from her PC and then presses the Upload button. After each upload, the miniaturized window updates and flashes in red briefly.

10

WELCOME,
 NAME : _____
 EMAIL : _____
 PASSWORD : _____
 CONTINUE
 G W E R T Y U I O P #
 A S D F G H J K L
 Z X C V B N M BACKSPACE
 SPACE BAR ENTER
 SENIOR GAME PACK

P4:
Interface
design

Main screen
sketches

WELCOME PAGE (START) → WELCOME PAGE (REGISTER, REGISTERED, GUEST)
 USER DOUBLE-CLICKS ON START BUTTON
 WELCOME PAGE (REGISTER, REGISTERED, GUEST) → MAIN MENU (GAME 1, GAME 2, GAME 3)
 USER CLICKS ON ONE BUTTON FOR USER STATUS
 MAIN MENU (GAME 1, GAME 2, GAME 3) → GAME 1 (INFORMATION ABOUT GAME, BENEFITS OF PLAYING, PLAY, BACK)
 USER CLICK ON WANTED GAME TO START PLAYING
 GAME 1 (INFORMATION ABOUT GAME, BENEFITS OF PLAYING, PLAY, BACK) → GAME 1 (GAME 1)
 USER READ INFO AND START ACTUAL PLAYING
 THERE IS AN OPTION TO GO BACK TO MAIN MENU

P4:
Storyboard

for each of
your 3 tasks



Screen Layout

What do we know so far?

13



Screen Layout

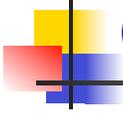
What do we know so far?

How do we implement these?

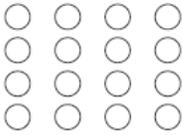
- Human memory & attention
- Gestalt laws of human perception
- Design Principles
 - Nielsen's Heuristics
 - Norman's Heuristics

14

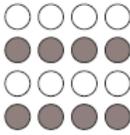
Gestalt principles of grouping



proximity



similarity



continuity



closure



symmetry



15

Heuristics / Design Principles

How do we implement them?



1. Simple and Natural Dialogue
2. Speak the User's Language
3. Minimize User Memory Load
4. Consistency
5. Feedback
6. Clearly Marked Exits
7. Shortcuts
8. Good Error Messages
9. Prevent Errors
10. Help and Documentation
11. Use Appropriate Affordances
12. Visibility / Obviousness

Guidelines for Graphic Design

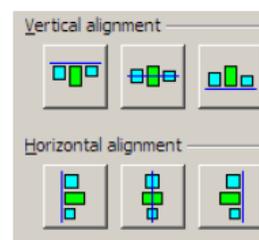
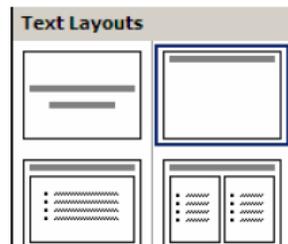
Designing Visual Interfaces, Mullet '95

- Simplicity
- Contrast
- White space
- Alignment

18

Simplicity

- Remove unnecessary widgets
- Use regularity in design (fonts, lines, colors)



19

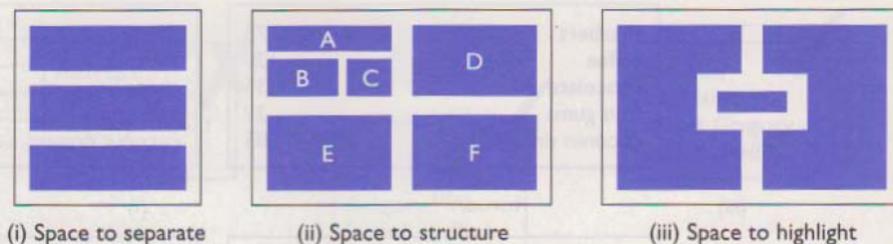
Interface Layout

- Simplicity is the key



Dix 5.7

Using whitespace



(i) Space to separate

(ii) Space to structure

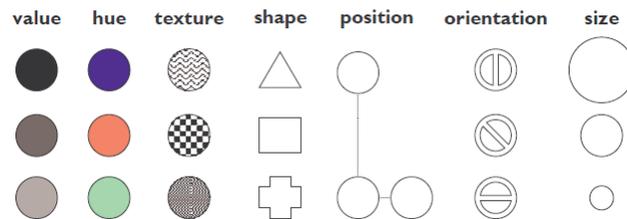
(iii) Space to highlight

Figure 5.12 Using white space in layout

- Use to group controls instead of lines
- Use margins (faster to scan)
- Don't crowd controls together

Contrast

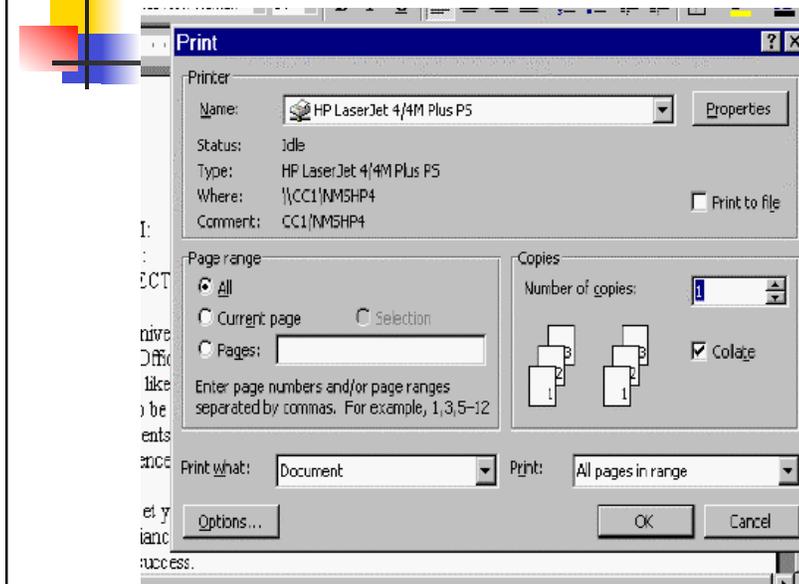
- The irregularity in a design that communicates information
- Dimensions that afford low effort contrast



- Use the "squint test"

23

Example: Word 97 print



24

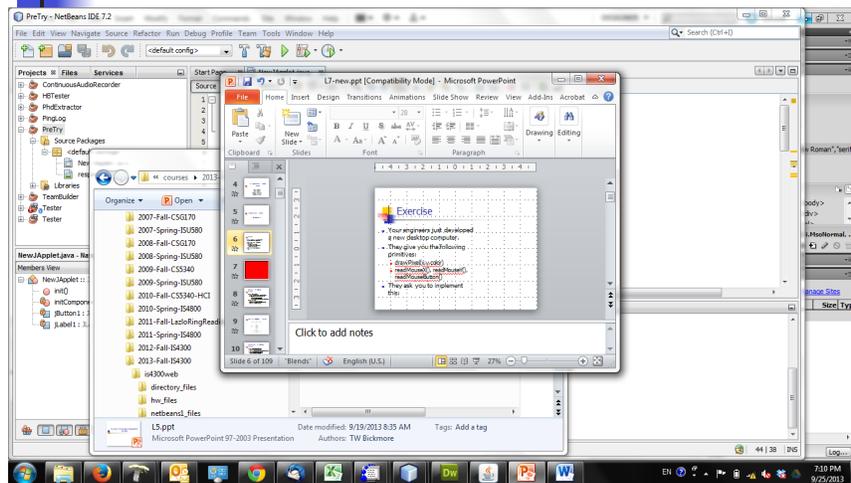
How to create "natural groupings"?

- Card sort!



25

WIMP components



26

Component Heuristics

Stone, et al, User Interface Design and Evaluation

- Primary windows
 - Driven by main tasks & task objects
- Tabs
 - Information on different tabs should be independent.
 - Should not be used for sequential steps.

Modem-2	F-Macros	F-Macros-2	AutoMacros	AutoMacros-2	Buttons		
Buttons -2	AutoReply	AutoReply-2	Window	Window-2	Safety		
Device	Device-2	Terminal	Logging	Emulation	Transfer	Transfer-2	Modem

27

Menus

Schneiderman & Plaisant

- Names should indicate purpose
- Use task semantics to organize menus
- Prefer broad-shallow to narrow-deep
- Group items meaningfully
- Sequence items meaningfully
- Use brief items
- Use consistent grammar, layout, and terminology

28

Designing Menus



Component Heuristics

Stone, et al, User Interface Design and Evaluation

- **Toolbars**
 - ToolTips can help users learn the meanings of icons.

- **Buttons**
 - Label indicates the action the button does
 - Place along bottom of dialog boxes
 - Should be same size and shape. Different widths OK for row of buttons.

Component Heuristics

Stone, et al, User Interface Design and Evaluation

- List (combo) boxes
 - Use when there are a large number of options, OR if the list is likely to change
- Text box
 - If you cannot anticipate user input
 - Size of the box should indicate amount of info required

31

Icons

- Design icons that are visually simple but informative, represent concrete objects when possible.
- Easier to understand than text?
- In practice, a picture to decorate a label
- May help with memorability



33

Icons

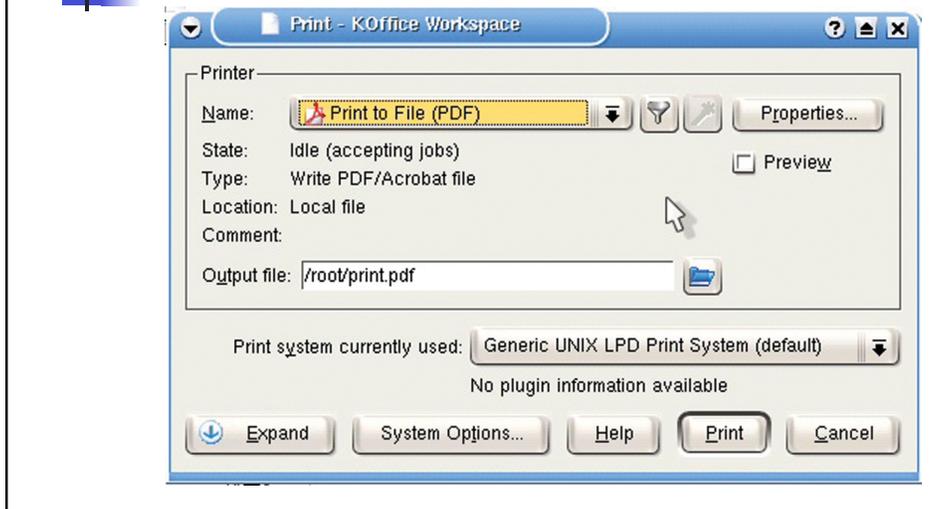


- Icons represent features and functions.
- Help people recognize which feature they need to access.
- Icons make use of three principle types of representation
 - Metaphor relies on people transferring knowledge from one domain and applying to another.
 - Direct mapping - creating a more or less direct image of what the icon is intended to represent.
 - Convention - arbitrary design, which has become accepted as standing for what is intended over time.

Horton's checklist for icon designers

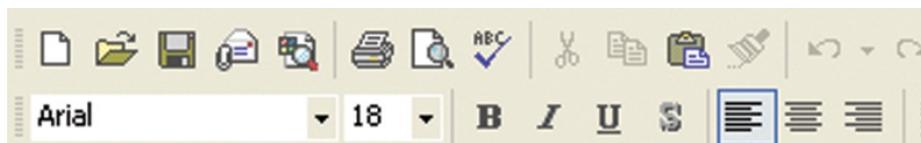
- Understandable. Spontaneously suggest the intended concept to the viewer?
- Familiar. Objects in the icon ones familiar to the user?
- Unambiguous. Are additional cues (label, other icons documentation) available to resolve any ambiguity?
- Memorable. Feature concrete objects in action?
- Informative. Why is the concept important?
- Few. Is the number of arbitrary symbols less than 20?
- Distinct. Is every icon distinct from all others?
- Attractive. Does the image use smooth edges and lines?
- Legible. Test all combinations of color and size?
- Compact. Is every object, every line, every pixel necessary?
- Coherent. Is it clear where one icon ends and another begins?
- Extensible. Can I draw the image smaller? Will users still recognize it?

Modal (vs. Modeless) Dialog



Tool Bars

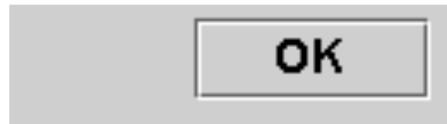
- Good for efficiency of expert users





Command Buttons

- Labels are important
- Most important at left and top
- All buttons should be same size, but adjusting width for label length is OK



Text

- Conventions of typography and graphic design help us interpret that text as if it were on a page.
- Human readers benefit from many centuries of refinement in text document design.
- Heuristics
 - Line length ~60 chars / 8-12 words
 - Left-justified
 - Lines with distinct thoughts, or that end on grammatical boundaries are best

42

Dix 5.7

Laying out columns

(i) **Hard to scan across cols**

sherbert	75
toffee	120
chocolate	35
fruit gums	27
coconut dreams	85

(ii)

sherbert	75
toffee	120
chocolate	35
fruit gums	27
coconut dreams	85

(iii)

sherbert	75
toffee	120
chocolate	35
fruit gums	27
coconut dreams	85

(iv)

sherbert	75
toffee	120
chocolate	35
fruit gums	27
coconut dreams	85

43

Color

This text is difficult to read

This text is easy to read

(a)

Use sparingly.

Don't rely on it:
Remember 5-8% of users are likely to be color blind.

Keep contrast in mind.

Red on blue

Blue on red

Green on pink

Pink on green

Dark blue on yellow

Yellow on dark blue

(b)

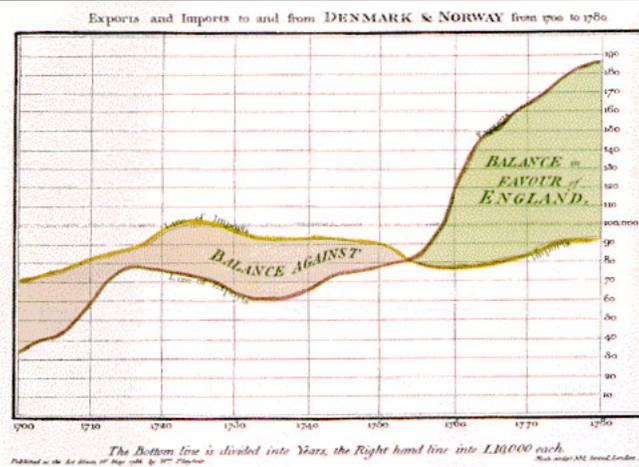
Designing with color

Marcus '92

- Use a maximum of 5 +/- 2 colors.
- Color connotations can vary dramatically even within a culture.
 - E.g., blue in the US is interpreted differently by different groups – for healthcare professionals it is taken to indicate death; for movie-goers it is associated with pornography; for accountants it means reliability or corporateness (think of the 'Big Blue' – IBM).

Images: Graphs

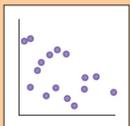
Centuries of conventions



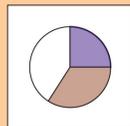
UIDE Chapter 13

Images: Graphs

Scatterplots



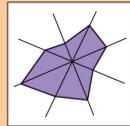
Pie charts



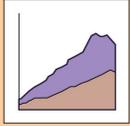
Line graphs or curves



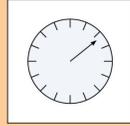
Radar



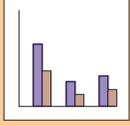
Area, band, strata or surface charts



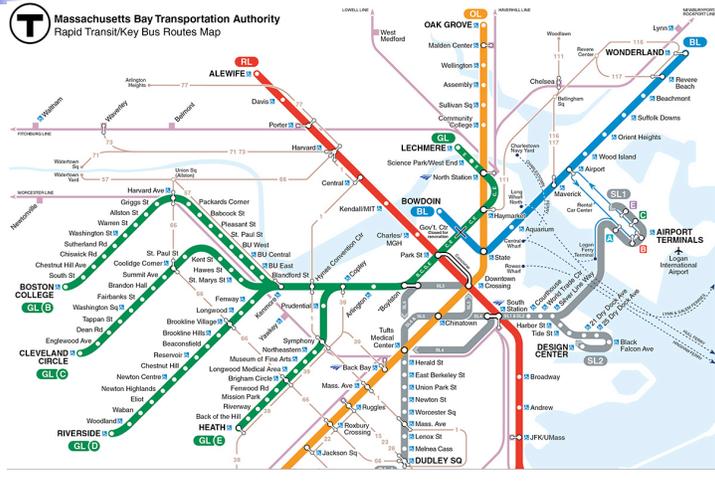
Star, circular or pattern charts



Bar graphs, column charts or histograms



Node and Link Diagrams



T Massachusetts Bay Transportation Authority
Rapid Transit/Key Bus Routes Map

48

Sound

kinds? when to use?

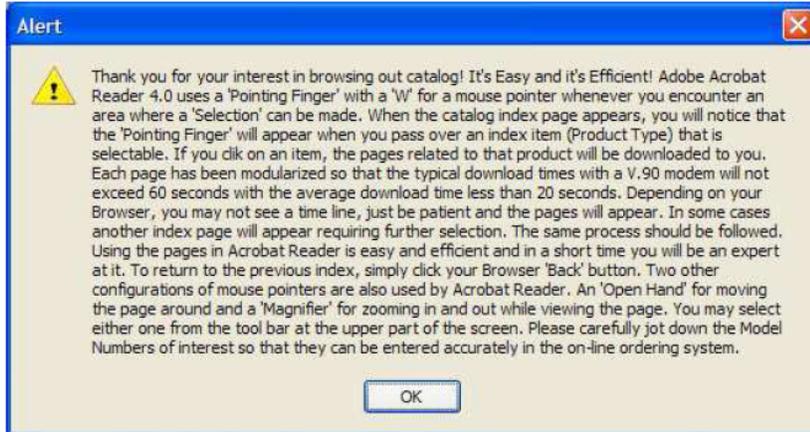
- Different Types of Sound
 - Ambient, sound effects, music, speech
 - "audio icons" = familiar
 - "earcons" = synthetic
- Making Good Use of Sound Effects
 - Reinforcement, completion of an operation, attract attention.
- Using Music Effectively
 - Signature, evocative, atmosphere
- Using Speech Effectively
 - Tone, pace, accent
- TEST for annoyingness!

Generated Speech

- demo



Critique?



51

Critique?



```

usCallback(TRUE));

action(strServerName, nPort);
CHttpConnection::HTTP_VERB_GET,
NULL, dwHttpR
aders);

Ret);
pt the user fo
ED)

g(NULL, ERROR_INTERNET_INCORRECT_PASSWORD,
GENERATE_DATA | FLAGS_ERROR_UI_FLAGS_CHANGE_O
the dialog, bail out
    
```



Most Important Concerns in Screen Design

- Use restraint
 - Keep it as simple as possible
- Logically group widgets
 - Spatially or using panels/borders/tabs
- Try lots of variants
 - Critique, test, evaluate, to downselect

53

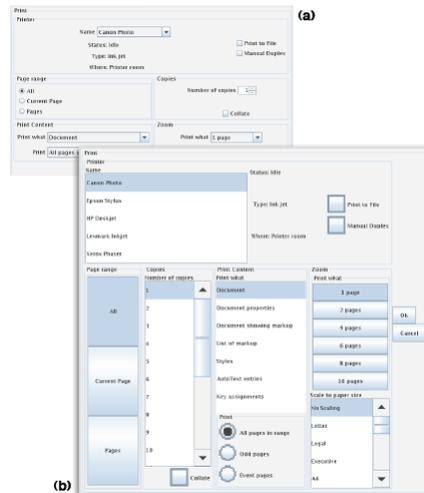
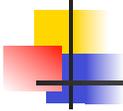
Exercise

- Project teams
- Sketch three versions of the main screen/window/dialogue for your most complex task

A hand-drawn sketch of a login screen. At the top, it says "WELCOME,". Below that are three input fields labeled "NAME:", "EMAIL:", and "PASSWORD:". Under the input fields is a button labeled "CONTINUE". Below the button is a keyboard layout with keys: Q, W, E, R, T, Y, U, I, O, P, #; A, S, D, F, G, H, J, K, L; Z, X, C, V, B, N, M; and a "SPACE BAR" key. To the right of the keyboard is a "BACKSPACE" key and an "ENTER" key. At the bottom of the sketch, it says "SENIOR GAME PACK".

Research: SUPPLE

Krzysztof Gajos

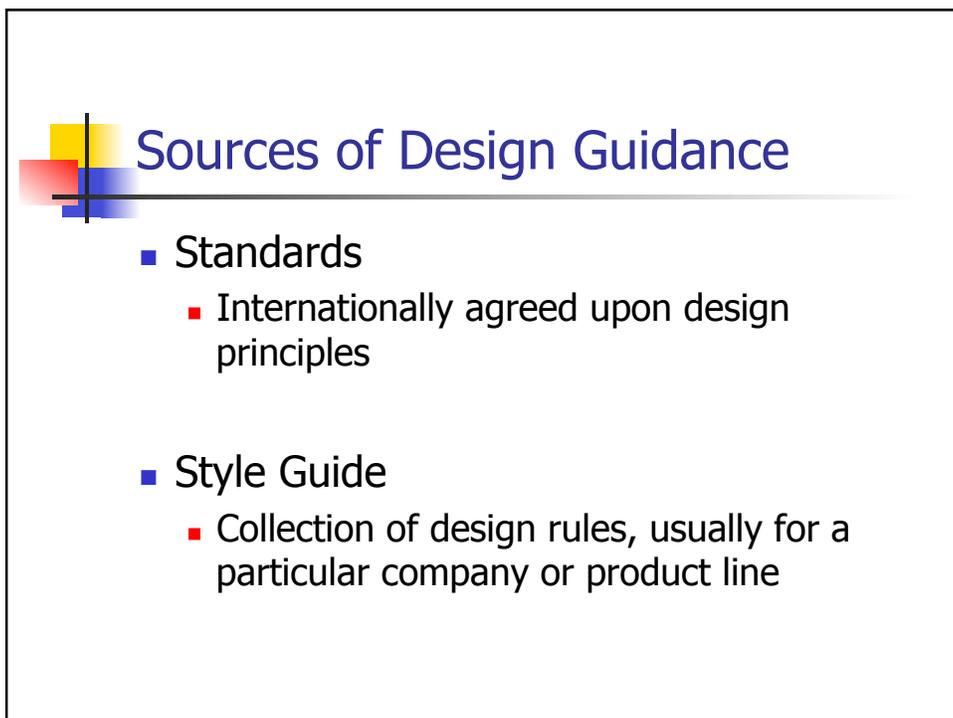


56

SUPPLE: Automatically Generating User Interfaces Adapted to Users' Motor and Vision Abilities

Krzysztof Z. Gajos
Jacob O. Wobbrock
Daniel S. Weld

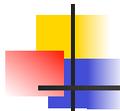






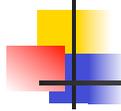
User Interface Standards

- Official, publicly available documents that define standards for user interface design
 - ISO 9241 – *Ergonomic requirements for office work with visual display terminals*
 - ISO 14914 – *Software ergonomics*
 - ISO 9241-210 – *Human-centered design process*
 - ISO 20282 – *Operation of everyday products*



Style Guides

- A typical guide includes:
 - Description of required interaction styles and user interface controls
 - Guidance on when and how to use the various styles or controls/widgets
 - Illustrations of styles and controls
 - Screen templates



Commercial Style Guides

- Apple Interface Guidelines
- Microsoft Windows UI Guidelines
- IBM's Common User Access
- Motif Style Guide
- Java Look and Feel

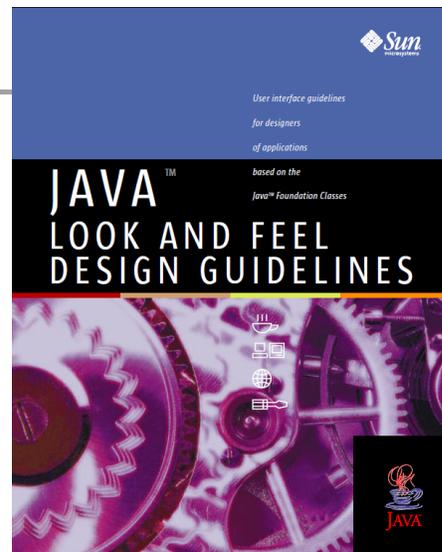


Last updates 2001

Fundamentals

The Java look and feel is the default interface for applications built with Java. The Java look and feel is designed for cross-platform use and can provide:

- Consistency in the appearance and behavior of common design elements
- Compatibility with industry-standard components and interaction styles
- Aesthetic appeal that does not distract from application content



Java Look and Feel

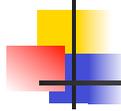
- Accessibility
- Internationalization
- Colors, Fonts, Capitalization
- Layout and Spacing of Widgets
- Icon design
- etc

64

Mouse Pointers

TABLE 7 Pointer Types Available in JDK 1.1 and the Java 2 SDK (200%)

Pointer	Macintosh	Windows 95	CDE	Usage In Java Look and Feel Applications
Default				Pointing, selecting, or moving
Crosshair				Interacting with graphic objects
Hand				Panning objects by direct manipulation
Move				Moving objects
Text				Selecting or inserting text
Wait				Indicating that an operation is in progress and the user cannot do other tasks
S Resize				Adjusting the lower (southern) border of an object
N Resize				Adjusting the upper (northern) border of an object
E Resize				Adjusting the right (eastern) border of an object



Customized Style Guides

- Create your own! For your specific project or product line...
- Helps focus on design issues early
- Enables use of principles and guidelines
- Steer decision making and serve as record
- Ensures internal consistency



Style Guides Bottom Line

- If you are building internal tools or one-off projects, using a GUI-builder will ensure most relevant design rules are followed.
- If you are building commercial UIs, your company will provide you with the style guidelines to use.
- You should not be worrying too much about this now in your team project, but they may provide guidance for design decisions.

P4 – Design Sketches

Due in 1 week

- You will explore possible design options, and sketch what your interface will look like.
- **Interaction Scenarios**
 - Expand each of your activity design scenarios (3+) into full interaction scenarios, thinking about what the user perceives and the actions he/she performs at each major step in the scenario.
- **Design Options**
 - Three options for your most important window or dialog box, and brief rationale for why you selected one over the other two.
- **Preliminary interface design.**
 - One or more sketched windows or dialog boxes, along with the menus and controls that the user manipulates.

68

P4 – Design Sketches

Due in 1 week

- **Storyboards.** For each of your tasks/scenarios, describe how your preliminary interface would be used to perform the task. Use rough sketches to illustrate how the interface would look at important points in the task.

69



To Do

- Read
 - Evaluation
 - Inspection
 - User testing
 - Evaluation
 - Swing layout managers.
- Finish by Next class
 - I5 – Painting applet
- Start
 - P4 – Design Sketches

72