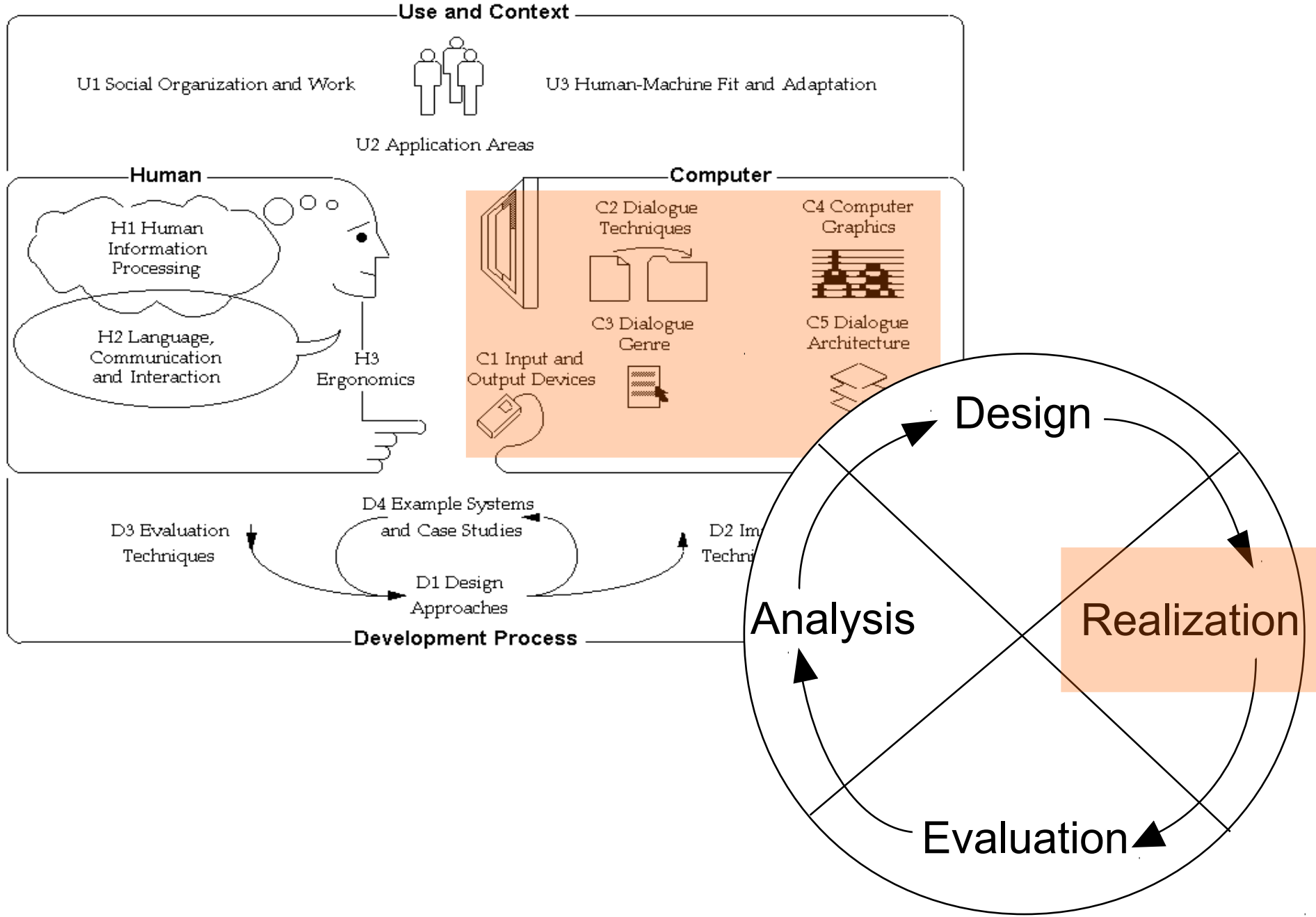


Mensch-Maschine-Interaktion 1

Chapter 8 (June 21st, 2012, 9am-12pm):
Implementing Interactive Systems

Overview

- Introduction
- Basic HCI Principles (1)
- Basic HCI Principles (2)
- User Research & Requirements
- Designing Interactive Systems
- Capabilities of Humans and Machines
- User Study Design & Statistics
- ***Implementing Interactive Systems***
- Basic HCI Models
- User-Centered Development Process



Implementing Interactive Systems

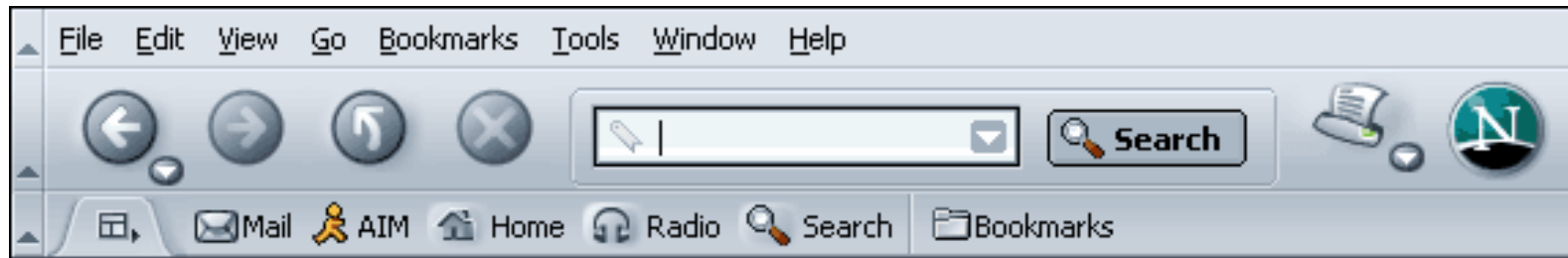
- Designing Look-And-Feel
- Constraints
- Mapping
- Implementation Technologies for Interactive Systems
- Standards and Guidelines

Visual Design

- Visual Arts versus Visual Design
 - Goal of the artist: to create an observable artefact that provokes an aesthetic response (kind of self-expression)
 - Goal of the designer: to find the representation that is best suited to the communication of some specific information (oriented towards goals of other people)
- Graphic Design and Visual Interface Design
 - Aesthetic concerns placed within the constraints of a functional framework
 - Designers working on interfaces needs to understand
 - » colour, typography, form, composition, ...
 - » **and** interaction, behaviour
- Industrial Design and Interface Design
 - New relationship coming up as more physical artefacts become software-enabled

Source: A. Cooper

Principles of Visual Design

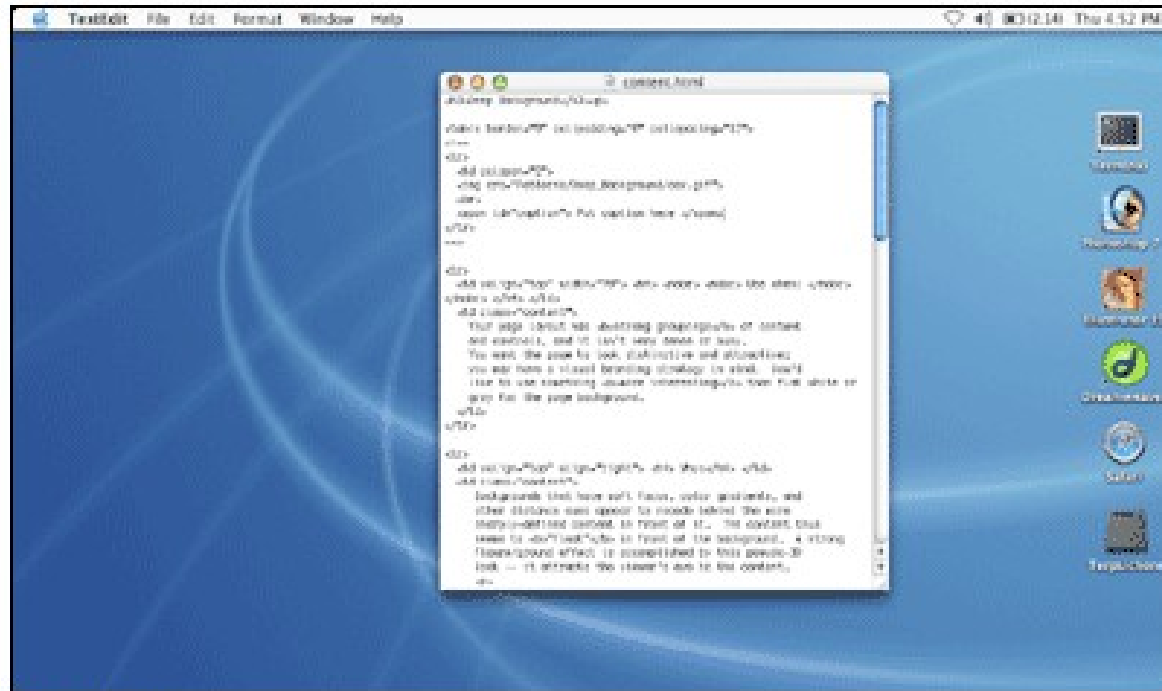


- Avoid visual noise and clutter
 - No superfluous elements that distract the user
- Use contrast, similarity and layering to distinguish and organize elements (*visual patterns*)
 - Dimensional contrast (depth)
 - Layering
 - Figure and ground
- Provide visual structure and flow at each level of organization
- Use cohesive, consistent and contextually appropriate imagery
- Integrate style and function comprehensively and purposefully
 - Form and function, branding

Based on Mullet/Sano 1995

Pattern: Deep Background (Tidwell)

Deep Background



From Mac OS/X

What: Place an image or gradient into the page's background that visually recedes behind the foreground elements.

Pattern: Few Hues, Many Values (Tidwell)

Few Hues, Many Values



From <http://thebanmappingproject.org>

What: Choose one, two, or at most three major color hues to use in the interface. Create a color palette by selecting assorted values (brightnesses) from within those few hues.

Example: Layering

The screenshot displays the Mercedes-Benz website interface, illustrating a layered design. At the top left is the Mercedes-Benz logo and brand name. A search bar is located at the top right. The main content area features a large background image of a snowy forest with the headline "4MATIC All-Wheel Drive. How to weather the weather." and the sub-headline "► CONTROL. UNLIKE ANY OTHER." Below this, five silver Mercedes-Benz cars are shown in a row. On the left side, a dark vertical navigation menu contains links such as "Models", "Select a Model", "Certified Pre-Owned", "Build Your Own", "Locate a Dealer", "Financial Solutions", "What's New", "Mercedes In Depth", and "Owners Online". At the bottom of the page, there are four promotional tiles: "Special Offer" with a Mercedes-Benz logo, "Take Advantage of Special Lease Offers.", "Grand Sports Tourer Vision R*", "The all-new 2005 SLK", and "4MATIC All-Wheel Drive". A "Portfolio Log-in" section is also visible in the bottom left.

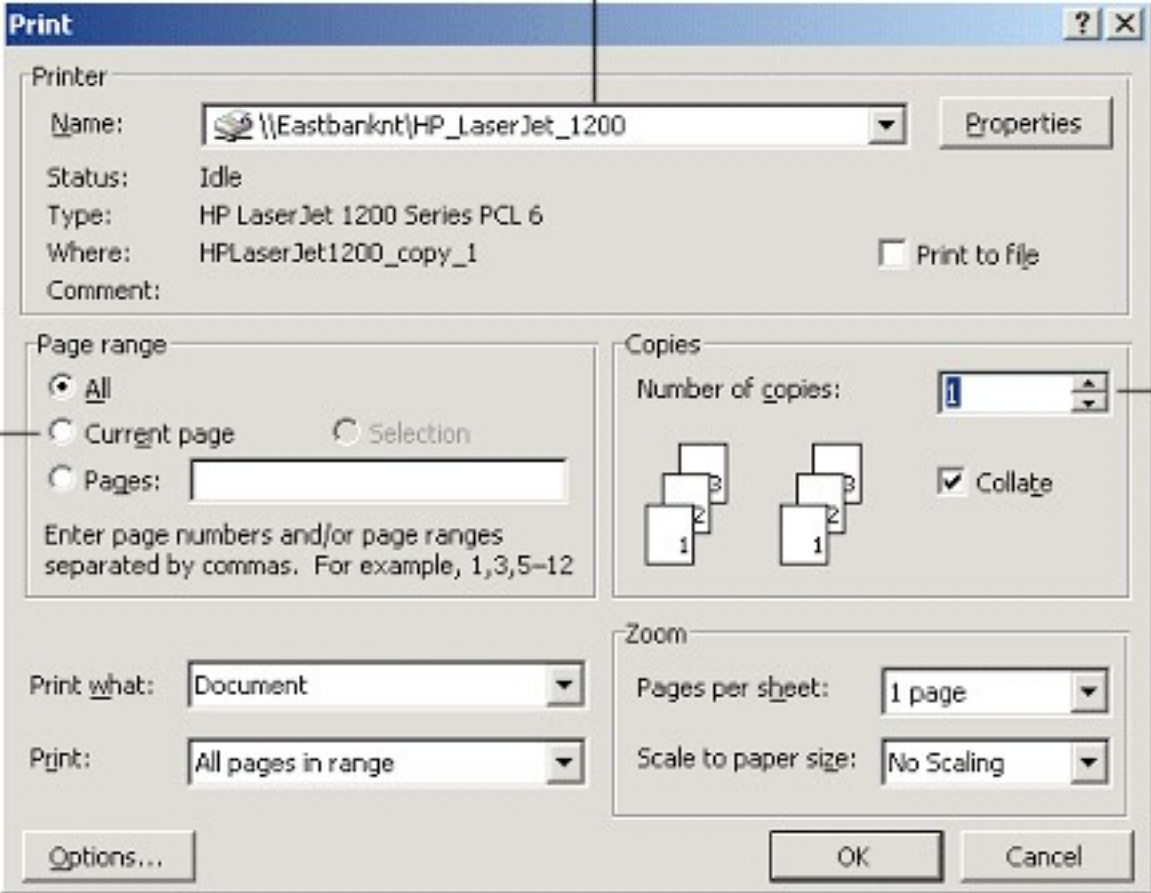
Source: Tidwell

Example: Visual Flow

Decide what to print (full document or just specific pages.

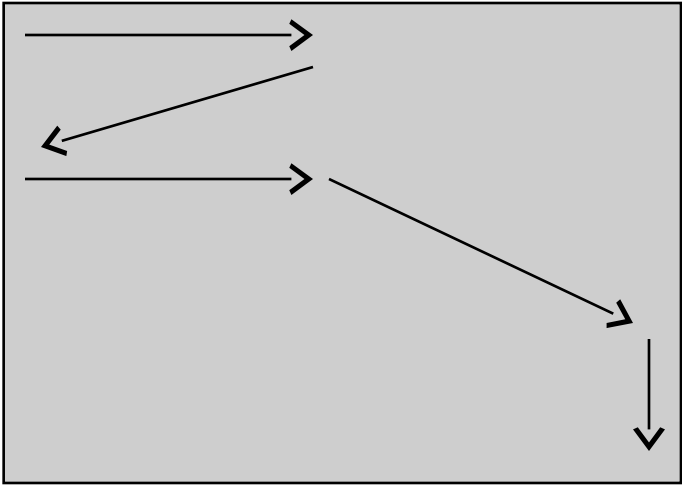
Select the printer you want to use (if you have a choice)

Decide how many copies you want to print.

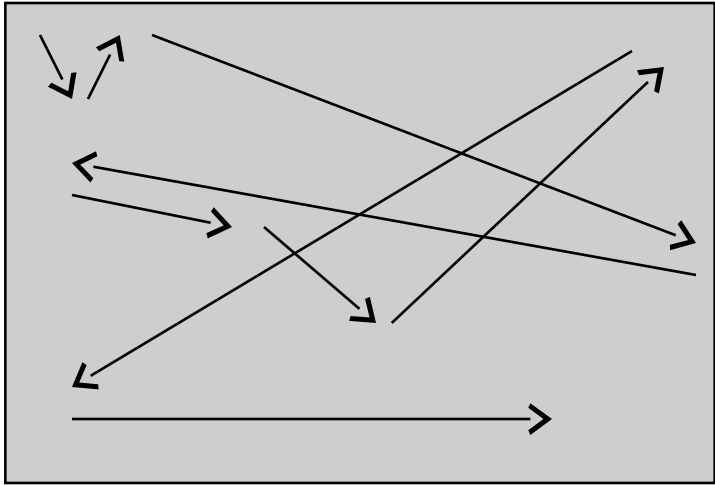


Grid
Group boxes

Good and Bad Logical Flow



Eye movements match the logical path through the interface
The interface

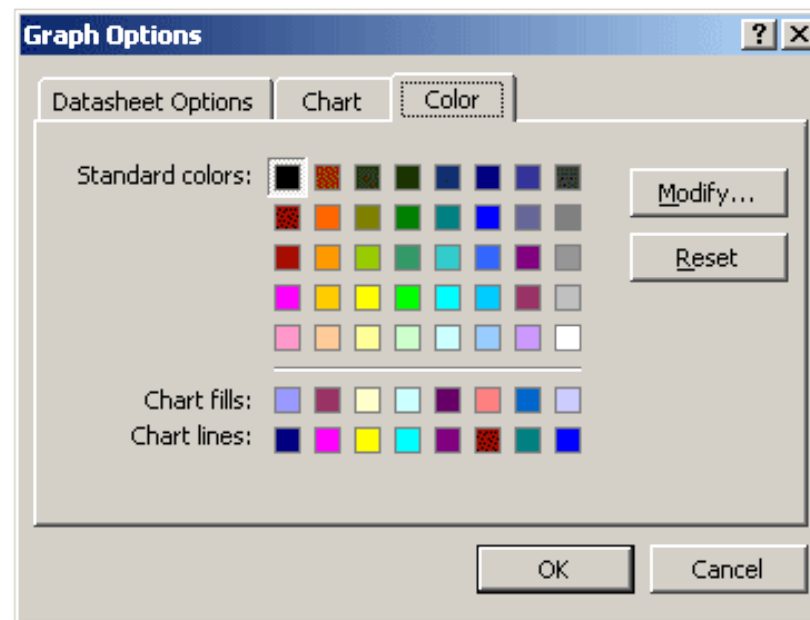


Everything is all over the place

Symmetry and Balance

- Symmetry gives interfaces a solid, stable look
- Balance of visual weights in asymmetric design

Diagonal Balance



Word's Graph Options dialog box

Tidwell:

What: Arrange page elements in an asymmetric fashion, but balance it by putting visual weight into both the upper-left and lower-right corners.

Implementing Interactive Systems

- Designing Look-And-Feel
- Constraints
- Mapping
- Implementation Technologies for Interactive Systems
- Standards and Guidelines

Constraints

- Physical constraints
 - Basic physical limitations
- Semantic constraints
 - Assumption to create something meaningful
- Cultural constraints
 - Borders and context provided by cultural conventions
- Logical constraints
 - Restrictions due to reasoning
- Applying constraints is a design decision!
 - Practical way to realise the principle “prevent errors”

GUI Example

Date unconstrained

Flüge online buchen

von: bitte auswählen

nach:

Hinflug am: Rückflug am:

Erw.: 1 Kinder bis 11: 0 unter 2: 0

Date constrained

1. Schritt

Angebote suchen für: Alle Linien- & Charterflüge

Hinreise am: Mi 12 Nov.2003

Rückreise am: Mi 19 Nov.2003

2. Schritt

Abflug von:

Reiseziel:

Klasse: Economy

Constraints & Redundancy



- Redundancy increases safety
 - E.g. labels and physical constraints
- Constraints can only work at their own level
- But: things can go wrong elsewhere

Defektes Nakosegerät

Unfallopfer mit Lachgas beatmet - Tödliche Klinik-Panne

Dieser Artikel stellt eine am 25.03.04 um 13:59 veröffentlichte Nachricht dar.

AKTUELLE NACHRICHTEN

Traunstein (rpo). Lachgas statt Sauerstoff - in einer bayerischen Klinik musste diese Verwechslung ein 19-Jähriger mit dem Leben bezahlen.

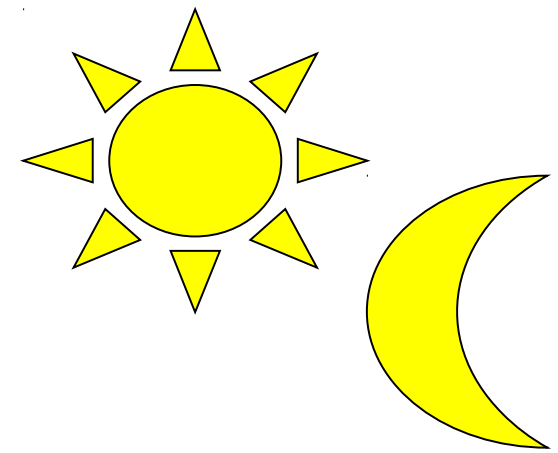
Durch ein falsch zusammengebautes Narkosegerät ist in einem bayerischen Krankenhaus ein Patient ums Leben gekommen. Der 19-Jährige war nach einem Verkehrsunfall in der Notaufnahme der Klinik in Trostbergan statt mit Sauerstoff mit Lachgas beatmet worden, wie die Staatsanwaltschaft Traunstein am Donnerstag sagte. Ermittelt werde gegen einen Mitarbeiter der Herstellerfirma, der das Gerät zuvor repariert hatte. Dabei seien die Anschlüsse für Lachgas und Sauerstoff vertauscht worden.

Physical Constraints & Affordances

- USB Memory Stick vs. DVD vs. money
 - If there is more than one option (physically) cater for these cases
- Dials vs. Buttons vs. Sliders
 - Dials are turned
 - Buttons are pressed
 - Sliders are pushed



Cultural Constraints



- Universal or culturally specific
- Arbitrary conventions that have been learned
- Users' expectations build on cultural constraints

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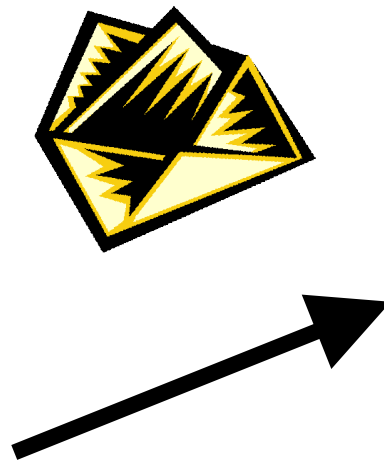
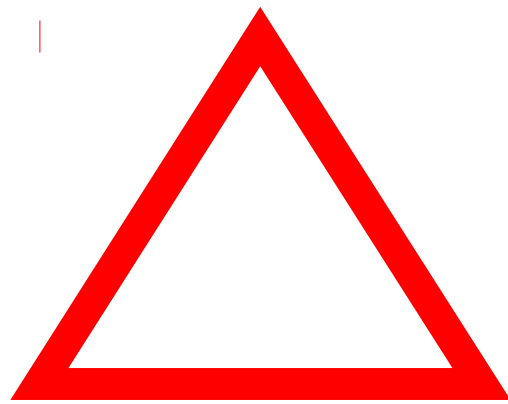
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“Hi there!”



Foreign Cultures: Example

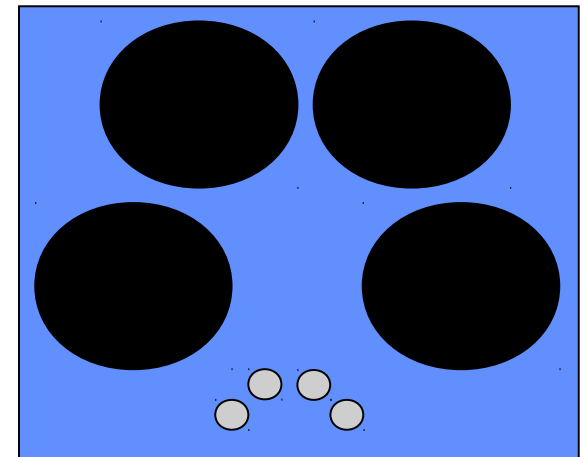
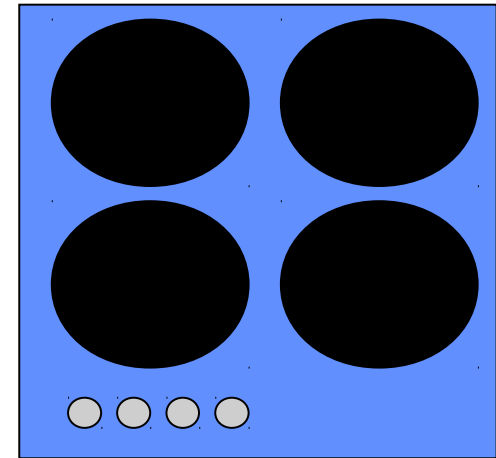


Implementing Interactive Systems

- Designing Look-And-Feel
- Constraints
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- Standards and Guidelines

Mapping

- Relationship between controls and action
- Mappings should be
 - Understandable
(e.g. moving the mouse up move the slider up)
 - Consistent
 - Recognizable or at least quickly learnable and easy to recall
 - Natural, meaning to be consistent with knowledge the user already has
- Example: cooker
- For these issues see also Gestalt theory!



Mapping & Gulf of Execution

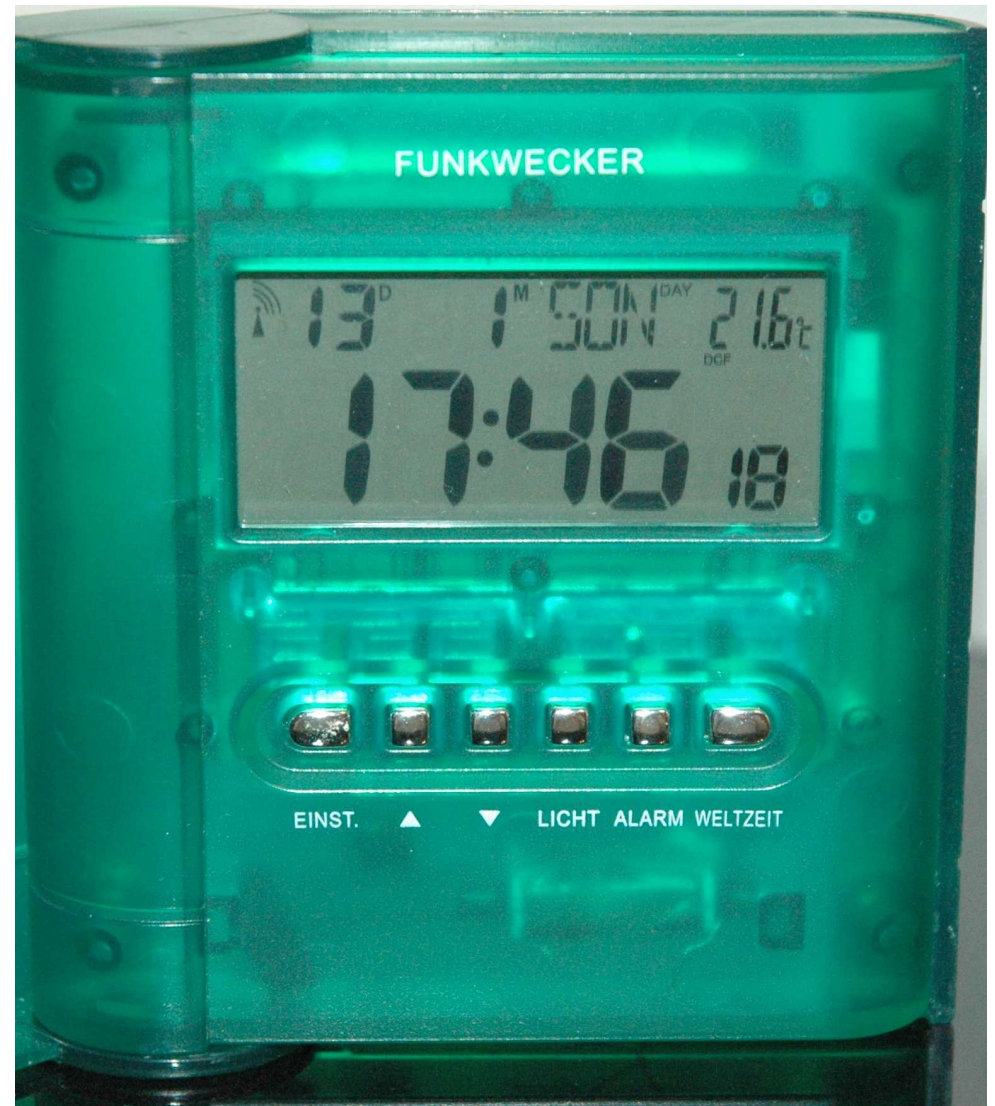
- Switch row on dashboard of a car:

ISO 2575



Mapping and Usage Context

- Switch row on (cheap) travel alarm clock



Mapping – Examples (1)

- Relationship between controls and action

Please attach a Message to Your Order.

Message Text:

Position to Print Message:

bottom

bottom-left

bottom-right

centre

left

right

top

top-left

top-right

Mapping – Examples (2)

- Relationship between controls and action

Please attach a Message to Your Order.

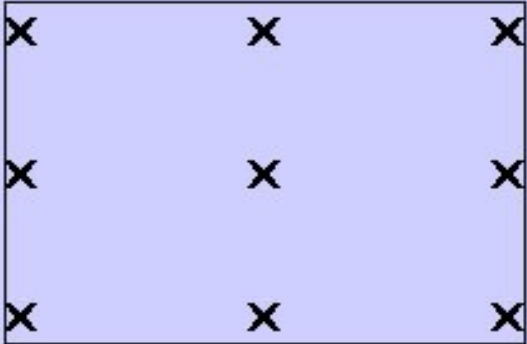
Message Text:

Position to Print Message:

bottom
 bottom-left
 bottom-right
 centre
 left
 right
 top
 top-left
 top-right

submit reset

Possible Label Positions



The image shows a screenshot of a web form with a light blue background. At the top, it says 'Please attach a Message to Your Order.' Below this is a text input field labeled 'Message Text:'. Underneath the input field is a section titled 'Position to Print Message:' containing a list of radio button options: 'bottom', 'bottom-left', 'bottom-right', 'centre', 'left', 'right' (which is selected), 'top', 'top-left', and 'top-right'. At the bottom of this section are two buttons: 'submit' and 'reset'. To the right of the radio buttons is a section titled 'Possible Label Positions' which contains a 3x3 grid of 'x' marks, representing the corners and midpoints of a square.

Mapping – Examples (3)

- Relationship between controls and action

Please attach a Message to Your Order.

Message Text:

Position to Print Message

<input type="radio"/> top-left	<input type="radio"/> top	<input type="radio"/> top-right
<input type="radio"/> left	<input type="radio"/> centre	<input checked="" type="radio"/> right
<input type="radio"/> bottom-left	<input type="radio"/> bottom	<input type="radio"/> bottom-right

Mapping – Examples (4)

- Relationship between controls and action

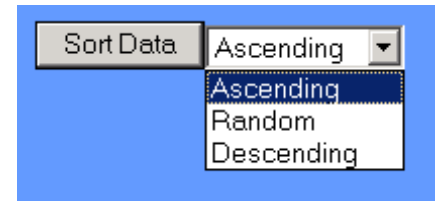
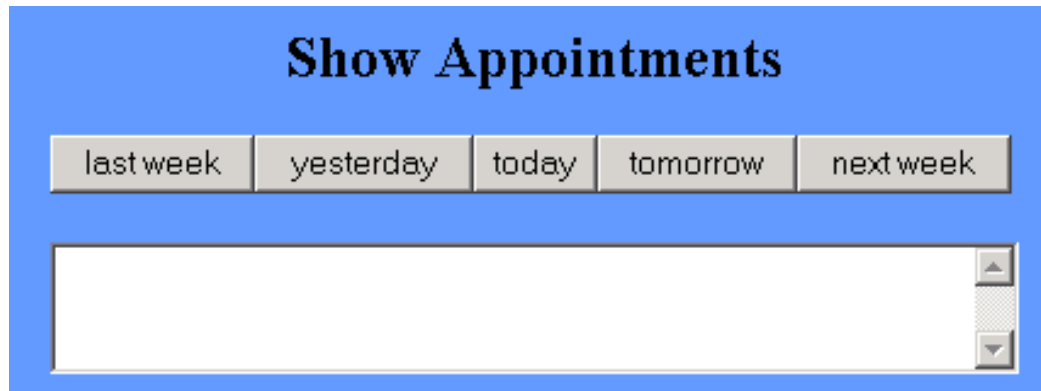
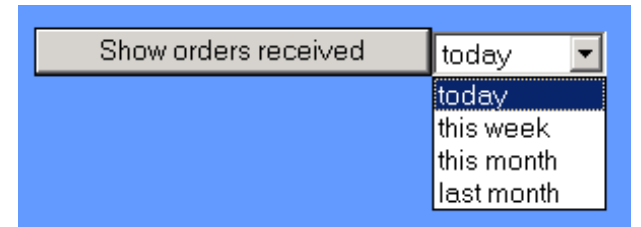
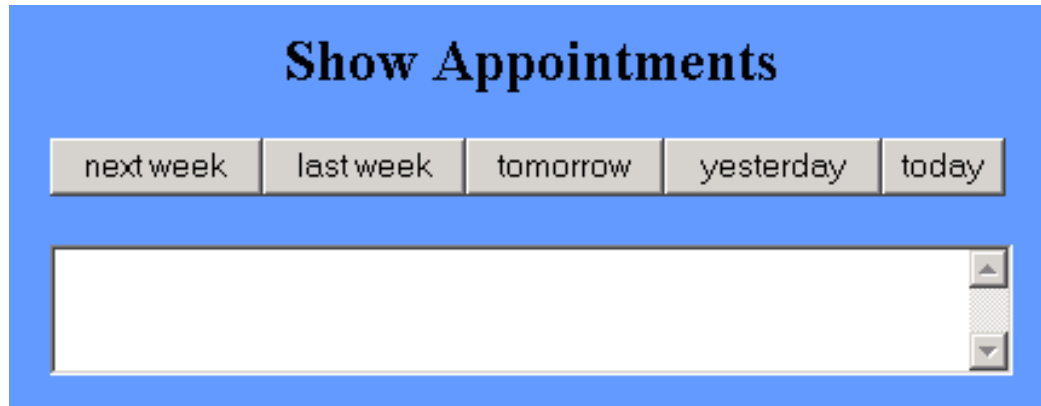
Please attach a Message to Your Order.

Message Text:

Position to Print Message

<input type="radio"/> top-left	<input type="radio"/> top	<input type="radio"/> top-right
<input type="radio"/> left	<input type="radio"/> centre	<input checked="" type="radio"/> right
<input type="radio"/> bottom-left	<input type="radio"/> bottom	<input type="radio"/> bottom-right

Mapping – Examples (5)



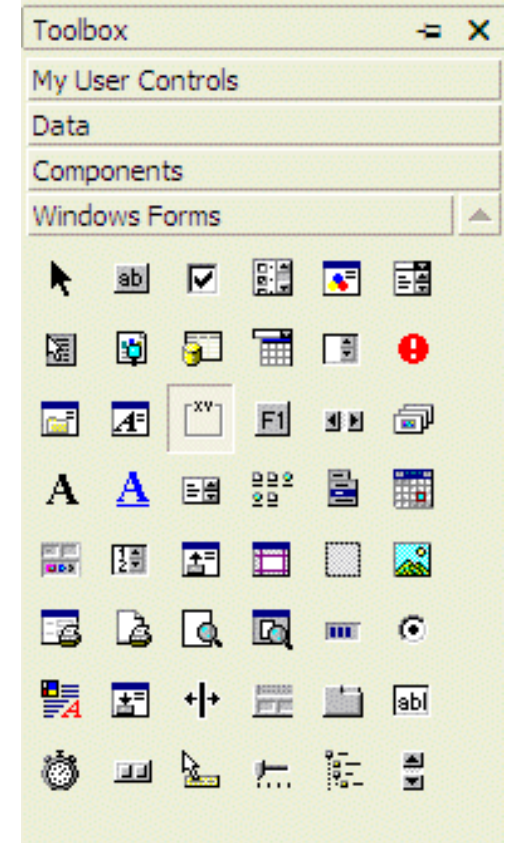
- “Natural” mappings can be found in many areas
- It is not always obvious what the “natural” mapping is
- Correlation with cultural constraints

Implementing Interactive Systems

- Designing Look-And-Feel
- Constraints
- Mapping
- Implementation Technologies for Interactive Systems
- Standards and Guidelines

User Interface Toolkits

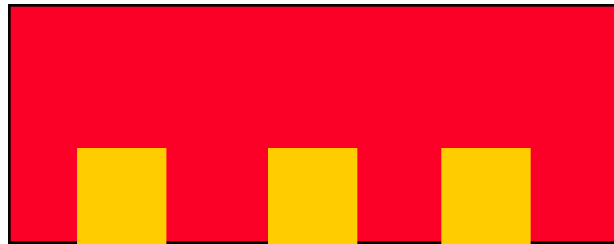
- Various forms:
 - Libraries
 - Frameworks
 - (Visual) components (*widgets*)
- Dependencies on
 - Programming language
 - Development tool (in particular for visual components)
 - Operating system
- Examples:
 - Java AWT & Swing
 - Windows Forms (C#, Windows)
 - Qt (C++, Unix)
 - Cocoa (MacOS)
 - GTK+ (C, Unix)
 - WXWidgets (cross-platform)





Visual C++

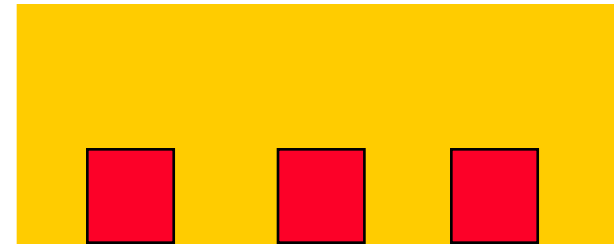
Class Library vs. Framework

Class library



-  Application-specific parts
-  Pre-fabricated parts

Framework



*"Don't call us,
we'll call you"*

- A framework defines a stand-alone, executable basis for a class of applications.
- Framework:
Application-specific code *is called from pre-fabricated code*.
- Class library:
Application-specific code *calls pre-fabricated code*.

User Interface Management System (UIMS)

- UIMS is a term used with a wide range of meanings:
 - Conceptual architecture for the structure of an interactive system
 - » separating application logic and interface
 - Techniques for implementing application and presentation parts
 - » providing the separation but preserving the intended connection
 - Support techniques for managing a run-time interactive environment
- In the following:
 - Focus on software architecture
- Advantages of separation between presentation and application:
 - Portability
 - Reusability
 - Multiple interfaces
 - Customization of interface

Implementing Interactive Systems

- Designing Look-And-Feel
- Constraints
- Mapping
- Implementation Technologies for Interactive Systems
- Standards and Guidelines

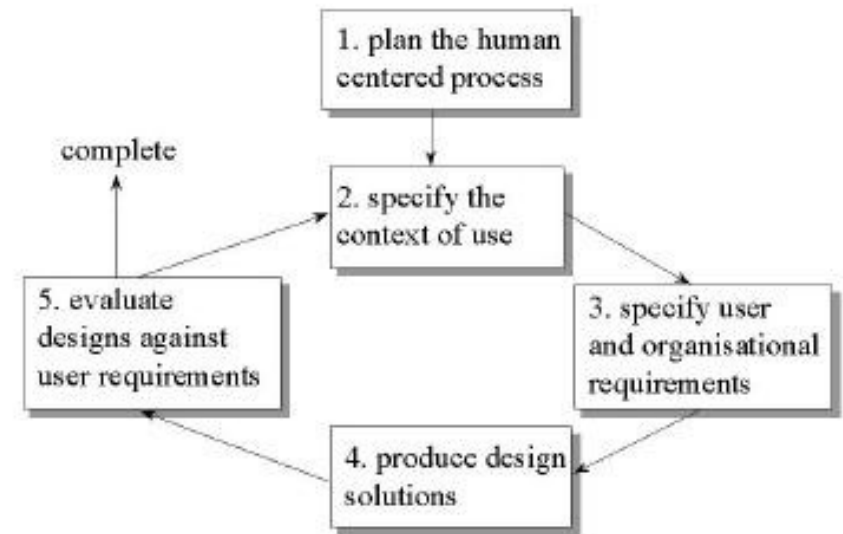
Standards (1)

- ISO 9241
 - Original title: *Ergonomic requirements for office work with visual display terminals (VDTs)*
 - New title: *Ergonomics of Human System Interaction*
 - Example: ISO 9241 Part 110 “Dialogue Principles”
 - » Suitability for the task
 - » Self-descriptiveness
 - » Controllability
 - » Conformity with user expectations
 - » Error tolerance
 - » Suitability for individualisation
 - » Suitability for learning

Standards (2)

- ISO 13407
 - Human-centered development process
 - See chapter 4
- ISO 14915
 - Design principles for multimedia user interfaces
- ISO 16071
 - Accessibility of human-computer interfaces
- BITV
 - Barrierefreie Informationstechnik-Verordnung
- BildscharbV
 - Bildschirmarbeitsverordnung

ISO 13 407 Model Overview



Hix and Hartson's Guidelines (1)

- User centered design
- Know the user
- Involve the user
- Prevent user errors
- Optimize user operation
- Keep control with the user
- Help the user to get started
- Give a task-based mental model
- Be consistent
- Keep it simple
- Design for memory limitations
- Use recognition rather recall
- Use cognitive directness
- Draw on real world analogies

(Hix and Hartson, Developing User Interfaces, Wiley, 1993)

Hix and Hartson's Guidelines (2)

- Use informative feedback
- Give status indicators
- Use user-centred wording
- Use non-threatening wording
- Use specific constructive advice
- Make the system take the blame
- Do not anthropomorphise
- Use modes cautiously
- Make user action reversible
- Get attention judiciously
- Maintain display inertia
- Organize screen to manage complexity
- Accommodate individual difference

(Hix and Hartson, Developing User Interfaces, Wiley, 1993)

GNOME Guidelines

- 1. Usability Principles
 - Design for People
 - Don't Limit Your User Base
 - Accessibility
 - Internationalization and Localization
 - Create a Match Between Your Application and the Real World
 - Make Your Application Consistent
 - Keep the User Informed
 - Keep It Simple and Pretty
 - Put the User in Control
 - Forgive the User
 - Provide Direct Manipulation
- 2. Desktop Integration
 - Placing Entries in the Applications Menu
 - Menu Item Names
 - ...
- 3. Windows
 - Titles
 - ...
 - Layout
 - Common Dialogs
- 4. Menus
 - The Menubar
 - Types of Menu
 - Drop-down Menus
 - ...
 - Help
- 5. Toolbars
 - Appearance and Content
 - ...
- 6. Controls
 - ...
 - Sliders
 - Buttons
 - Check Boxes
 - ...

Drag and Drop Semantics

Your application must determine whether to move or copy a dragged item after it is dropped on a destination. The appropriate behavior depends on the context of the drag-and-drop operation, as described in this section.

Move Versus Copy

If the source and destination are in the same container (for example, a window or a volume), a drag-and-drop operation is interpreted as a move (that is, cut and paste). Dragging an item from one container to another initiates a copy (copy and paste). The user can perform a copy operation within the same container by pressing the Option key while dragging. When performing a copy operation, indicate a copy operation to the user by using the copy cursor. (See [“Standard Cursors”](#) (page 67).)

Table 3-1 Common drag-and-drop operations and results

Dragged item	Destination	Result
Data in a document	The same document	Move
Data in a document	Another document	Copy
Data in a document	The Finder	Copy (creates a clipping)
Finder icon	An open document window	Copy
Finder icon	The same volume	Move
Finder icon	Another volume	Copy

Example 1:
Apple Human Interface Guidelines
(page 42)

Icon Genres and Families

Icon genres help communicate what you can do with an application before you open it. Applications are classified by role—user applications, software utilities, and so on—and each category, or genre, has its own icon style. This differentiation is very important for helping users easily distinguish between types of icons in the Dock.

Figure 5-1 Application icons of different genres—user applications and utilities—shown as they might appear in the Dock



For example, the icons for user applications are colorful and inviting, while utilities have a more serious appearance. Figure 5-2 shows user application icons in the top row and utility icons in the bottom row. These genres are further described in [“User Application Icons”](#) (page 57) and [“Utility Icons”](#) (page 58).

Figure 5-2 Two icon genres: User application icons in top row; utility icons in bottom row



Example 2:
Apple Human Interface Guidelines
(page 55)

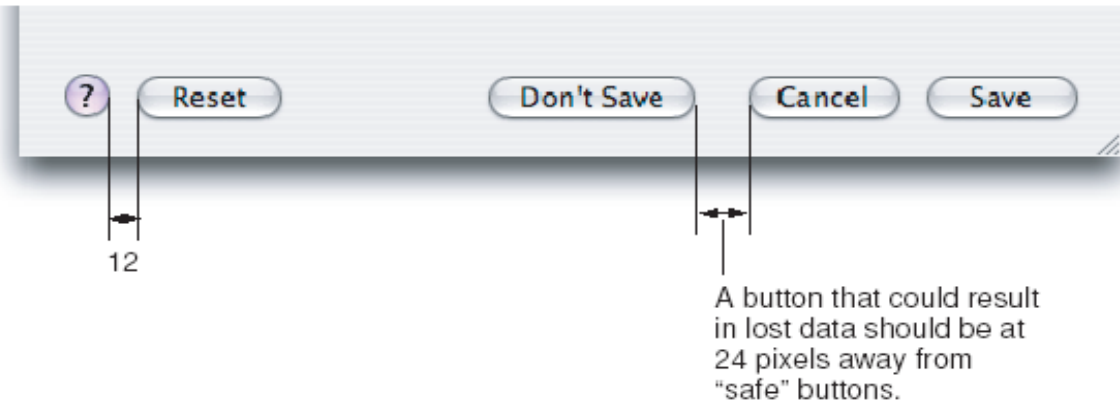


Figure 9-2 A standard alert



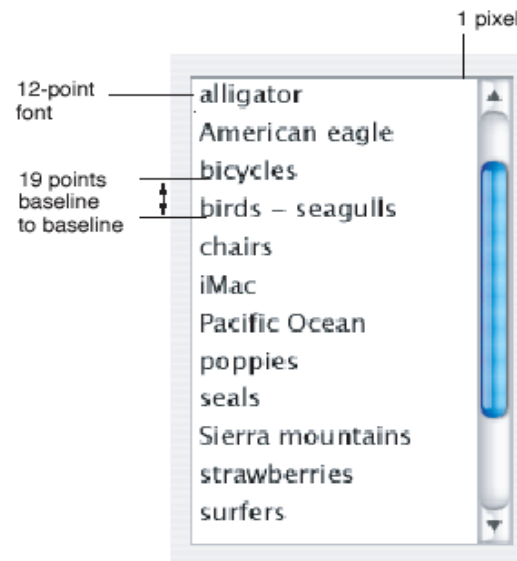
Example 3:
Apple Human Interface Guidelines
(page 126 & 134)

Figure 9-7 Position of buttons at the bottom of a dialog



Scrolling List Specifications

Figure 10-44 Scrolling list dimensions

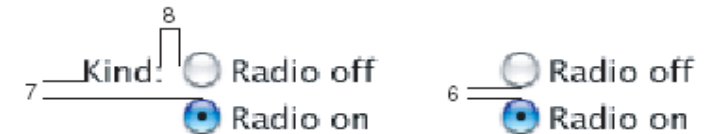


Example 4:
Apple Human Interface Guidelines
(page 138, 163 & 190)

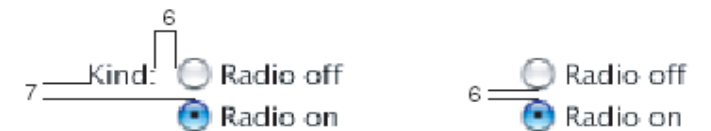
Radio Button Specifications

Figure 10-14 Radio button spacing

Full-size radio button



Small radio button



Mini radio button



Align the baselines of the label and the first button's text.

Figure 11-10 Layout dimensions for a standard alert

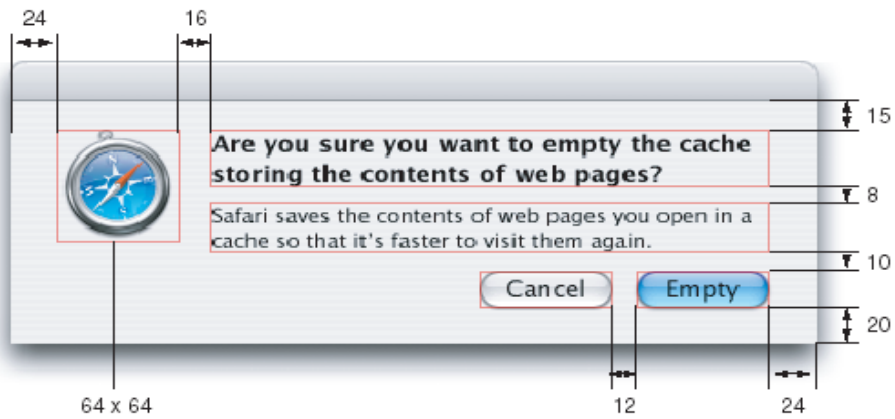
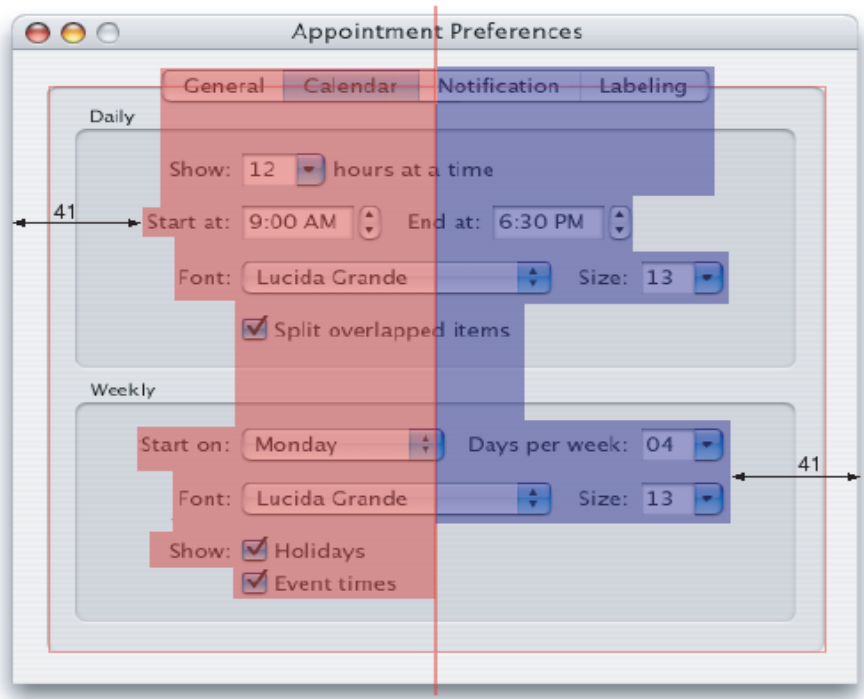
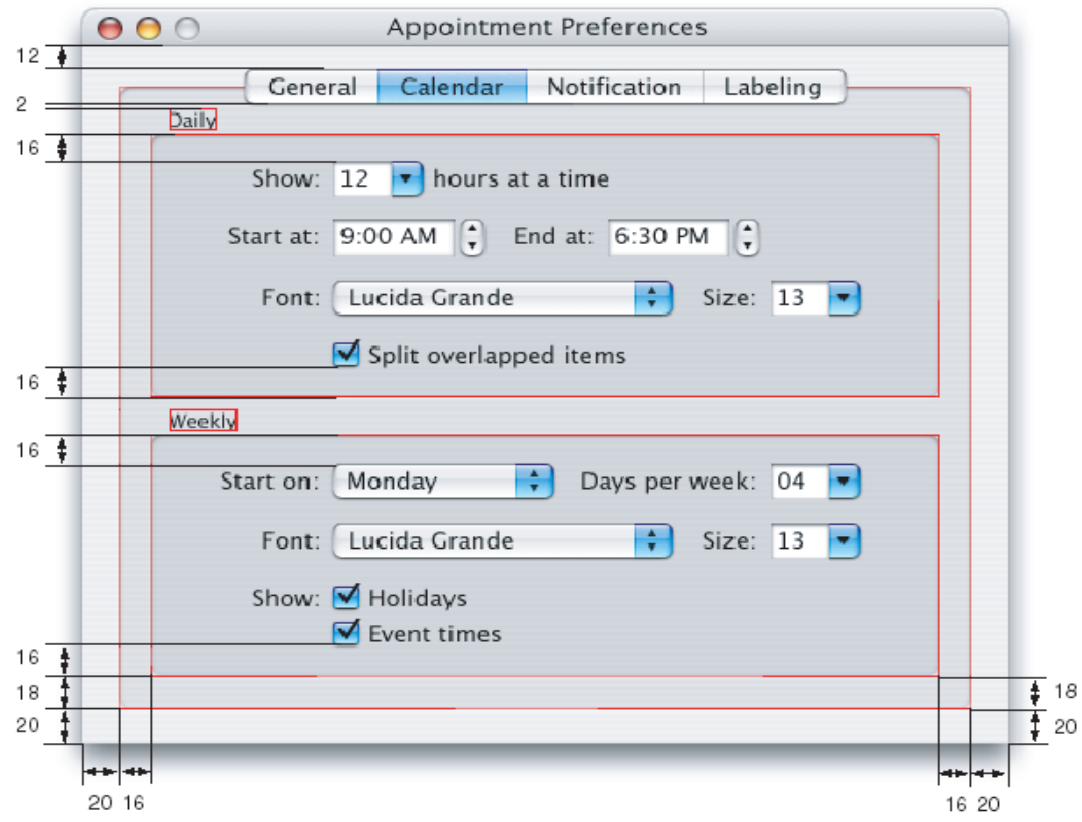


Figure 11-6 Center-equalization in a changeable pane dialog



Example 5:
Apple Human Interface Guidelines
(page 207, 209 & 210)

Figure 11-8 Layout dimensions for a changeable pane dialog



Specific Guidelines for Operating Systems, Window Managers, and the WWW

- Introduction to the Apple Human Interface Guidelines
<http://developer.apple.com/documentation/UserExperience/index.html>
- KDE User Interface Guidelines
<http://developer.kde.org/documentation/design/ui/>
<http://developer.kde.org/documentation/standards/kde/style/basics/>
- Palm OS® User Interface Guidelines
<http://www.accessdevnet.com/docs/ui/UIGuidelinesTOC.html>
- MSDN - User Interface Design and Development
<http://msdn.microsoft.com>
- GNOME Human Interface Guidelines (V2.3)
http://developer.gnome.org/projects/gup/hig/draft_hig_new/
- Web Guidelines
<http://www.webstyleguide.com/wsg3/index.html>
- ... and many others!

References

- B. Shneiderman: Designing the User Interface: Strategies for Effective Human-Computer Interaction, Third Edition. 1997.
- A. Cooper: About Face 2.0. Chapter 1 and 19 ff.
- Alan Dix, Janet Finlay, Gregory Abowd and Russell Beale: Human-Computer Interaction (third edition), Prentice Hall 2003
- D. A. Norman. The Design of Everyday Things. Basic Books 2002. Chapter 4.
- Jennifer Tidwell: Designing Interfaces - Patterns for Effective Interaction Design, O'Reilly 2005
<http://designinginterfaces.com/>