

Graphical Screen Design

CRAP – contrast, repetition, alignment, proximity

Grids are an essential tool for graphical design

Other visual design concepts

consistency

relationships

organization

legibility and readability

navigational cues

appropriate imagery

familiar idioms

Major sources: Designing Visual Interfaces, Mullet & Sano, Prentice Hall / Robin Williams Non-Designers Design Book, Peachpit Press

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CRAP

C

Contrast

- make different things different
- brings out dominant elements
- mutes lesser elements
- creates dynamism

R

Repetition

- repeat design throughout the interface
- consistency
- creates unity

A

Alignment

- visually connects elements
- creates a visual flow

P

Proximity

- groups related elements
- separates unrelated ones

A first lesson in Graphical Design

Contrast

Repetition

Alignment

Proximity

Example: [this page](#).

home page

[Original](#)

[Proximity 2](#)

[Alignment 3](#)

[Contrast 4](#)

[Repetition 5](#)

A First Lesson in Graphical Design

Contrast

Repetition

Alignment

Proximity

Examples

[This page](#)

[Saul's Home Page](#)

[Proximity](#)

[Alignment](#)

[Contrast](#)

[Repetition](#)



[Saul Greenberg](#)

[GroupLab](#)

[Dept Computer Science](#)

[University of Calgary](#)



Saul Greenberg, Professor
Human-Computer Interaction &
Computer Supported Cooperative Work
Dept. of Computer Science
University of Calgary
Calgary, Alberta
CANADA T2N 1N4
Phone: +1 403 220-6087
Fax: +1 403 284-4707
Email: saul@cpsc.ucalgary.ca

Research

[GroupLab project](#) describes research by my group

[Publications](#) by our group; most available in HTML, PDF, and postscript

[Project snapshots](#) describes select projects done in Grouplab

[Grouplab software repository](#)

[Grouplab people](#)

Graduate Students

I have a few openings for MSc and PhD students who are interested in Human Computer Interaction and / or Computer Supported Cooperative Work. [Some research and project ideas honors and graduate students](#)

Courses offered this year

[CPSC 481](#): Foundations and Principles of Human Computer Interaction

Original



[Saul Greenberg](#) [GroupLab](#) [Dept Computer Science](#) [University of Calgary](#)

Saul Greenberg, Professor
Human-Computer Interaction &
Computer Supported Cooperative Work

Dept. of Computer Science
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[CPSC 601.13](#): Computer Supported Cooperative Work

Proximity

World Wide Web Info for Saul Greenberg - Microsoft Internet Explorer

File Edit View Favorites Tools Help

Address  C:\Documents and Settings\Saul Greenberg\My Documents\My Webs\~saul\hci_topics\powerpoint_presentations2003\graphical_design\version Go


GroupLab
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Previous Years: [CPSC 681](#): Research Methodologies in Human Computer Interaction
[CPSC 699](#): Research Methodology for Computer Science (old!)
[CPSC 601.48](#): Special Topics: Heuristic Evaluation

Alignment

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Dept. of Computer Science
University of Calgary
Calgary, Alberta
CANADA T2N 1N4

Phone: +1 403 220-6087
Fax: +1 403 284-4707
Email: saul@cpsc.ucalgary.ca



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Research Ideas. I have a few openings for MSc and PhD students who are interested in Human Computer Interaction and / or Computer Supported Cooperative Work.

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CPSC 581: Human Computer Interaction II: Interaction Design

CPSC 601.13: Computer Supported Cooperative Work

Previous Years

CPSC 681: Research Methodologies in Human Computer Interaction

CPSC 699: Research Methodology for Computer Science (old!)

CPSC 601.48: Special Topics: Heuristic Evaluation

CPSC 601.56: Advanced Topics in HCI: Media Spaces and Casual Interaction

SENG 609.05: Graphical User Interfaces: Design and Usability

SENG 609.06: Special Topics in Human Computer Interaction

Ego alert: My entry on U Calgary's 'Great Teachers' Web Site

Administration

Ethics Committee for research with human subjects; I am the chair

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Repetition

Grids

Horizontal and vertical lines to locate window components

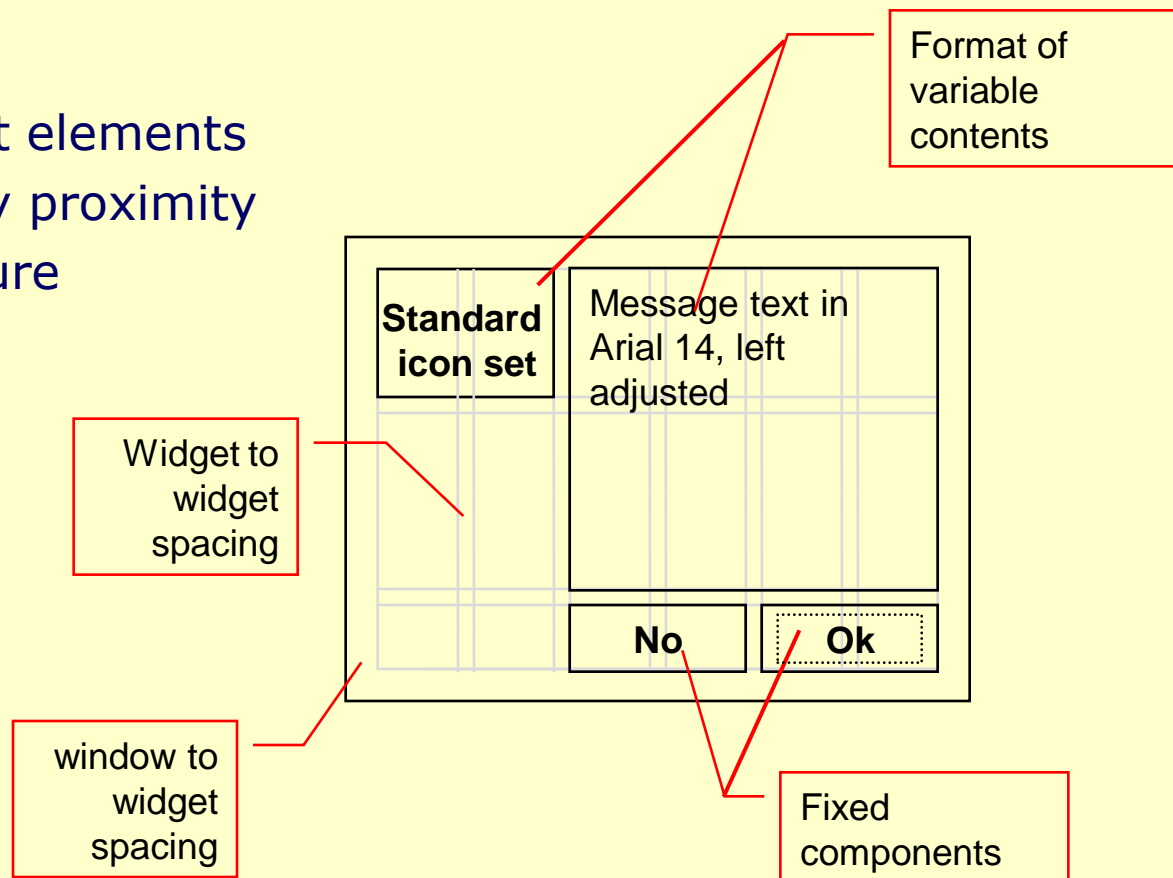
- aligns related components

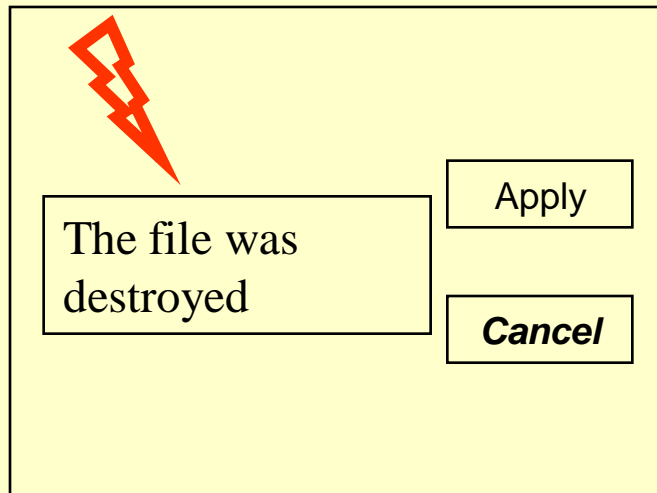
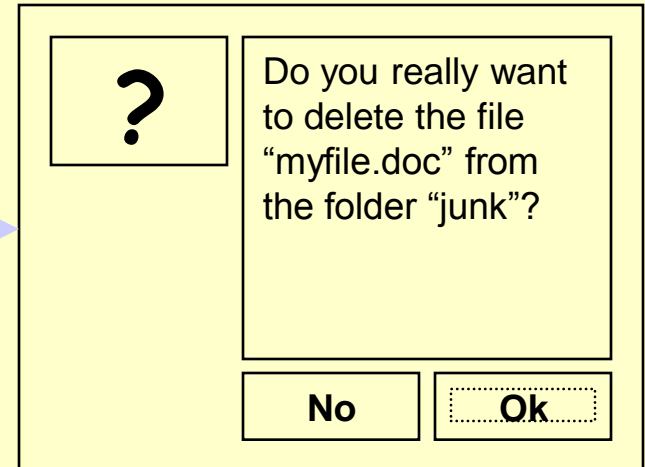
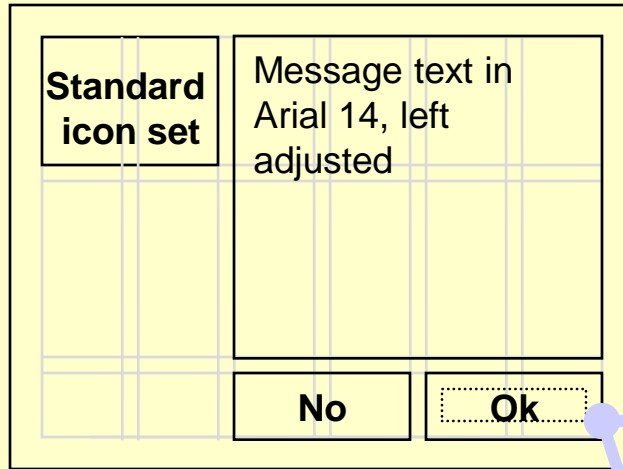
Organization

- contrast for dominant elements
- element groupings by proximity
- organizational structure
- alignment

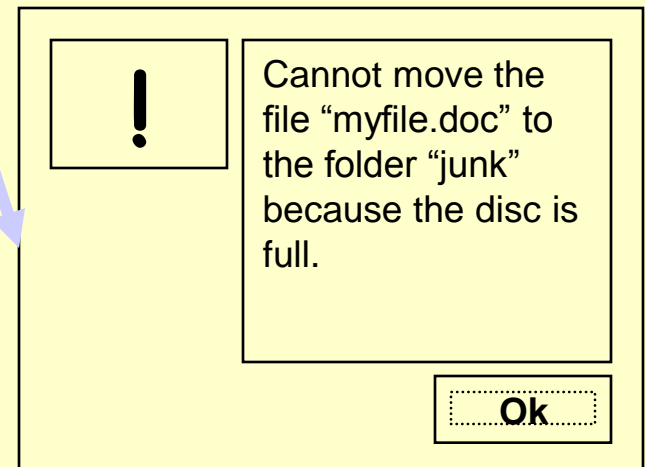
Consistency

- location
- format
- element repetition
- organization





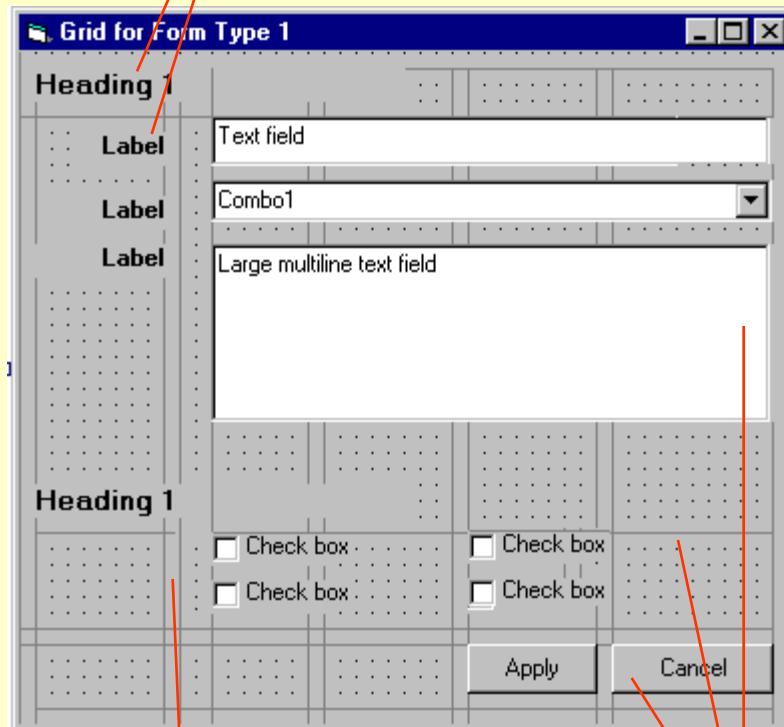
x



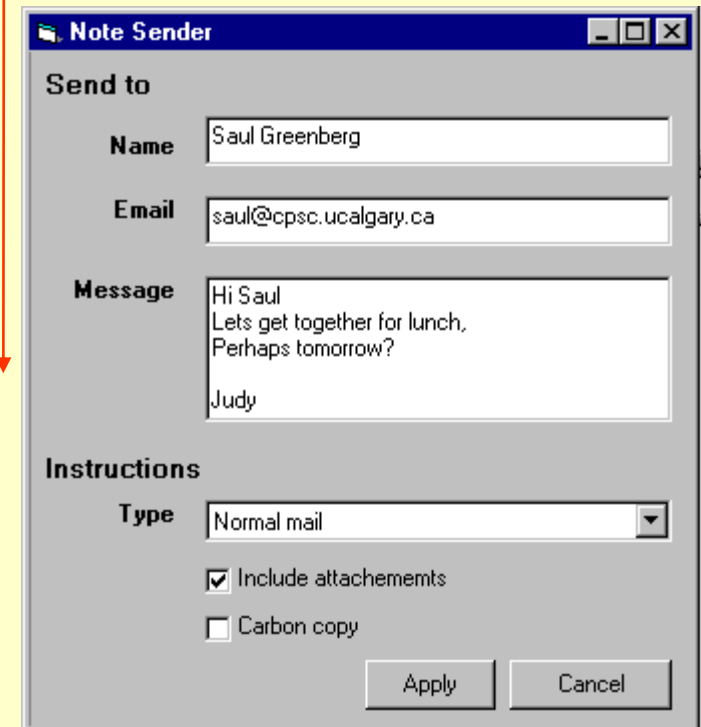
✓

Two-level Hierarchy
•indentation
•contrast

Logic of organizational
flow



A wireframe diagram of a form titled "Grid for Form Type 1". It features a grid layout with two main sections, each starting with a "Heading 1". The first section contains three labels followed by a text field, a combo box, and a large multiline text field. The second section contains four checkboxes and two buttons labeled "Apply" and "Cancel". Red lines connect the text boxes to the design principles on the right.



A functional form titled "Note Sender". It includes a "Send to" section with fields for "Name" (Saul Greenberg) and "Email" (saul@cpsc.ucalgary.ca). The "Message" section contains the text: "Hi Saul", "Lets get together for lunch, Perhaps tomorrow?", and "Judy". The "Instructions" section has a "Type" dropdown set to "Normal mail", and checkboxes for "Include attachememts" (checked) and "Carbon copy" (unchecked). "Apply" and "Cancel" buttons are at the bottom right. A red arrow points from the wireframe to this form.

Alignment connects
visual elements in a
sequence

Grouping
by white
space

Visual consistency (repetition)

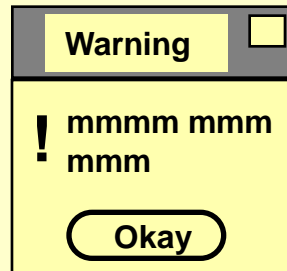
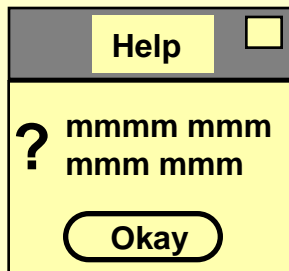
internal consistency

- elements follow same conventions and rules
- set of application-specific grids enforce this

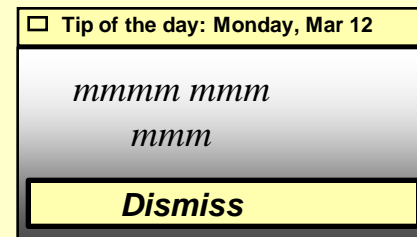
external consistency

- follow platform and interface style conventions
- use platform and widget-specific grids

deviate only when it provides a clear benefit to user



✓



✗

Relating screen elements

proximal clusters
alignment
white (negative) space
explicit structure

Mmmm:

Mmmm:

Mmmm:

Mmmm:

Mmmm:

x

Mmmm:

Mmmm:

Mmmm:

Mmmm:

Mmmm:

Mmmm:

Mmmm:

Mmmm:

Mmmm:

Mmmm:

✓

Form Title -- (appears above URL in most browsers and is used by W/W/W search)		Background Color:
Q&D Software Development Order Desk		FFFBF0
Form Heading -- (appears at top of Web page in bold type)		Text Color:
Q&D Software Development Order Desk		000080
E-Mail responses to (will not appear on)	Alternate (for mailto forms only)	Background Graphic
dversch@q-d.com		
Text to appear in Submit button	Text to appear in Reset button	<input type="radio"/> Mailto
Send Order	Clear Form	<input checked="" type="radio"/> CGI
Scrolling Status Bar Message (max length = 200 characters)		
WebMania 1.5b with Image Map Wizard is here!		
<< Prev Tab		Next Tab >>

Terrible alignment

- no flow

Poor contrast

- cannot distinguish colored labels from editable fields

Poor repetition

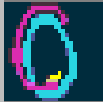
- buttons do not look like buttons

Poor explicit structure

- blocks compete with alignment

No regard for
order and
organization

Advanced FAX Settings

 **Aptiva Communication Center**

Speaker setting

☐ On ☒ On until connect ☐ Off

Wait **seconds for connection**

Retry after **seconds** **Number of retries**

Resolution

☒ Fine ☐ Standard

Maximum transmit rate:

Paper size:

☒ **Use custom editor:** **Browse...**

Save **Cancel** **Help**

Haphazard layout

xbugtool 2.0 Beta 2 **Server: elmer-bb.Corp**

Bug Id: _____ Cc: _____ Mode:

Category: _____ Priority:

1	2	3	4	5
---	---	---	---	---

Subcategory: _____ Severity:

1	2	3	4	5
---	---	---	---	---

Resp Mgr: _____ Bug/Rfe:

bug	rfe
-----	-----

State: _____ Responsible Engineer: _____

Synopsis: _____

Keywords: _____

State triggers:

Duplicate of: _____ Interest list: _____

Patch id: _____ See also (bug ids): _____

History:

Submitter : _____ Date: _____

Generic SVR4 problem?:

Dispatch operator : _____ Date: _____

Evaluator : _____ Date: _____

Commit operator : _____ Date: _____

Fix operator : _____ Date: _____

Repairing the layout

Report ▾View ▾Props ▾Help ▾

Mode: CreateEdit

Bug ID: ▾

Type: BugRFE

Category: ▾ XView

Priority: 12345

Subcategory: ▾ library

Severity: 12345

Release: ▾ 1.0

Status: Submitted

Synopsis:

Keywords:

Pub Summary:

See also:

Interest List:

DescriptionWork AroundSuggested FixCommentsEvaluation

Root Cause: ▾ documentation-confusing

Same as:

Resp Mgr: ▾ none

Hook 1:

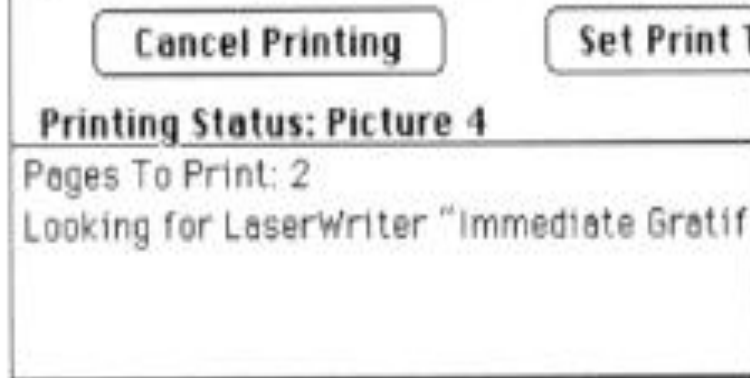
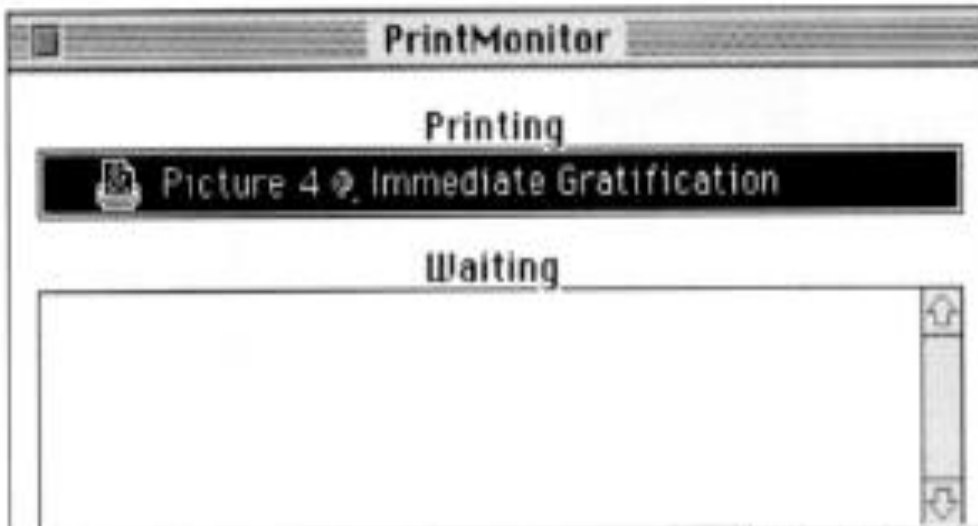
Resp Engr: ▾ none

Hook 2:

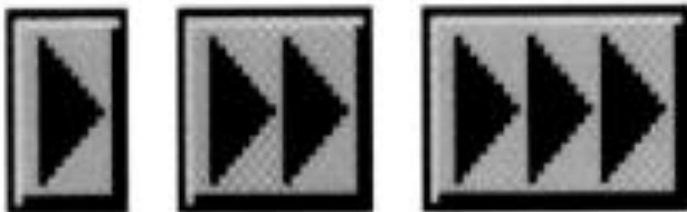
Flags: ☐ Fix Affects Documentation

☐ Generic SVR4 Problem

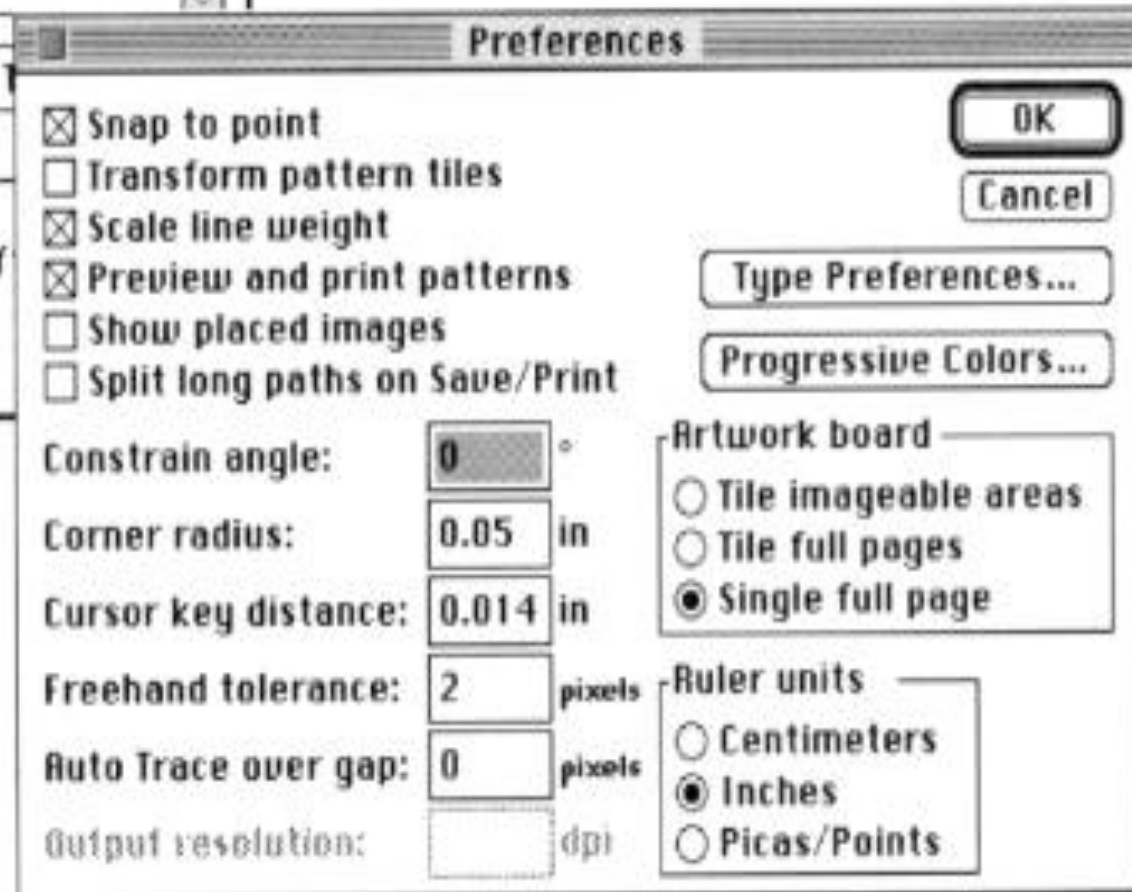
Spatial Tension

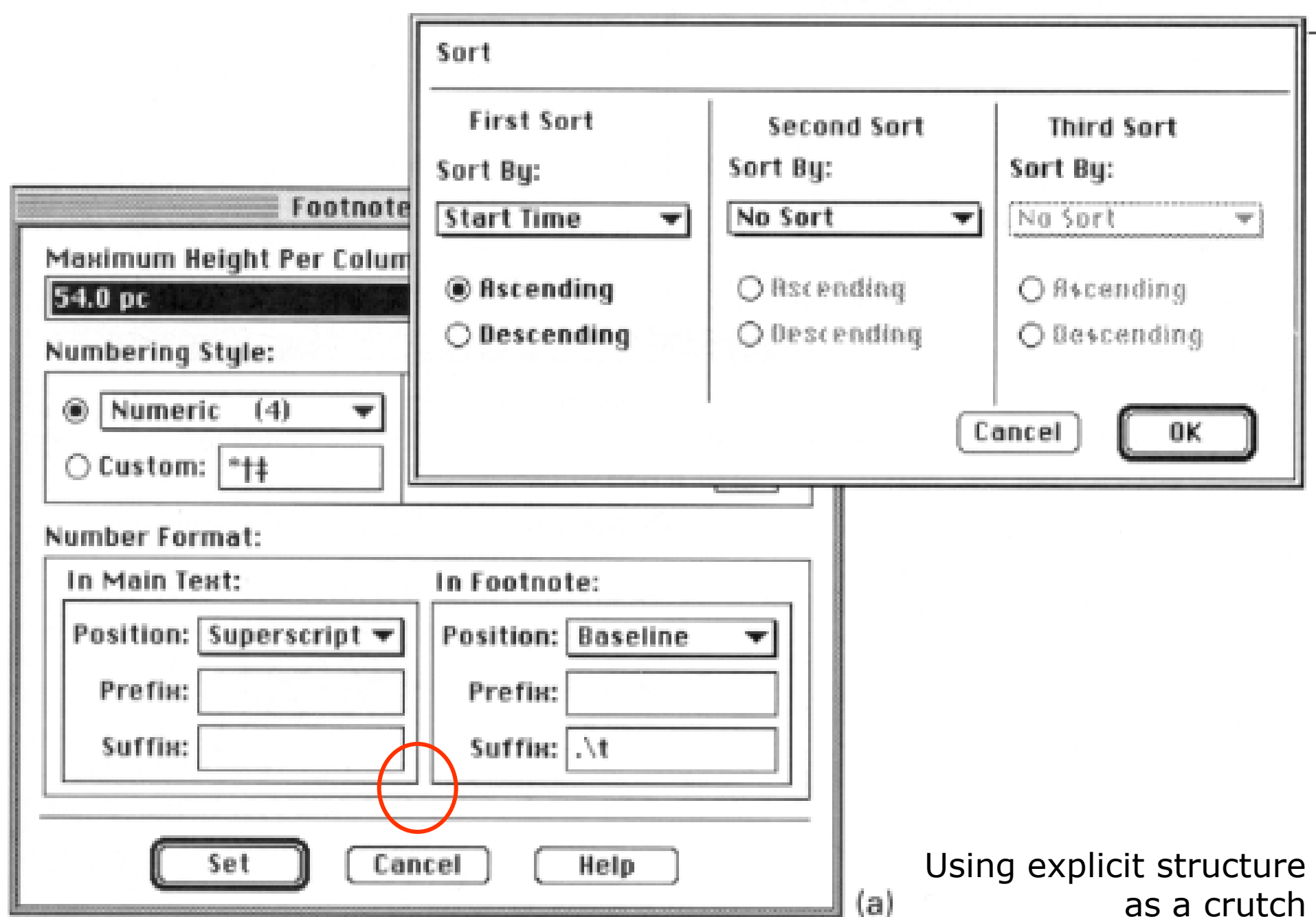


(a)



(b)

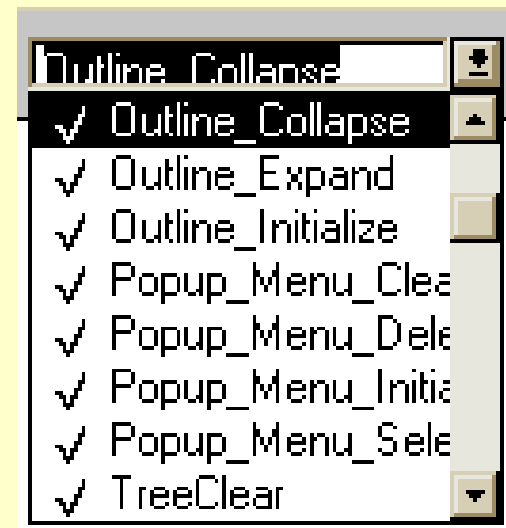
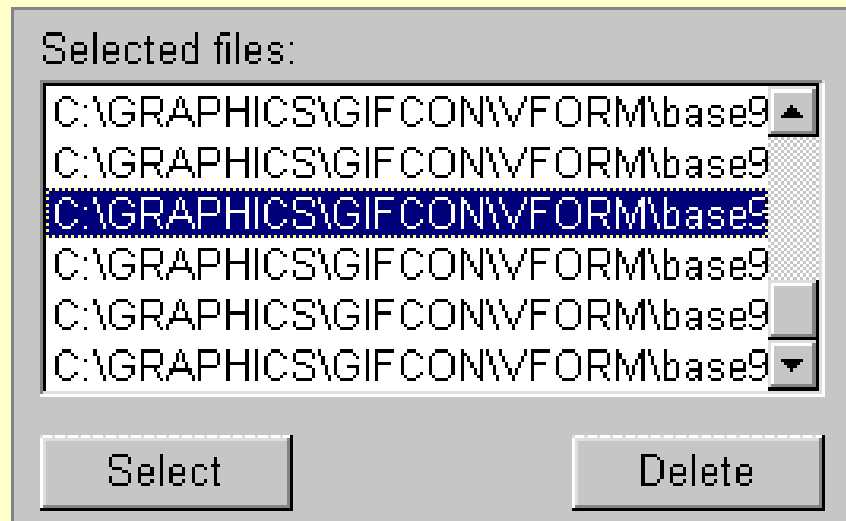




Using explicit structure
as a crutch



Overuse of 3-d effects makes the window unnecessarily cluttered



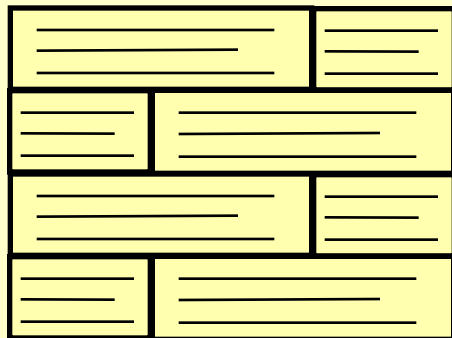
How do you chose when you cannot discriminate screen elements from each other?

Navigational cues

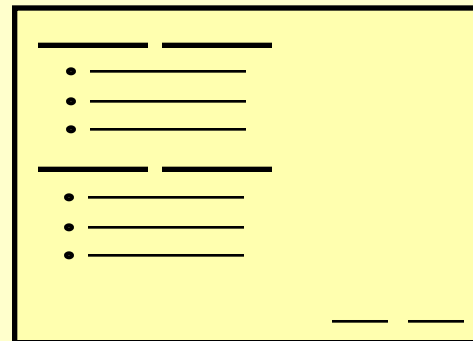
provide initial focus

direct attention as appropriate to important 2ndary, or peripheral items as appropriate

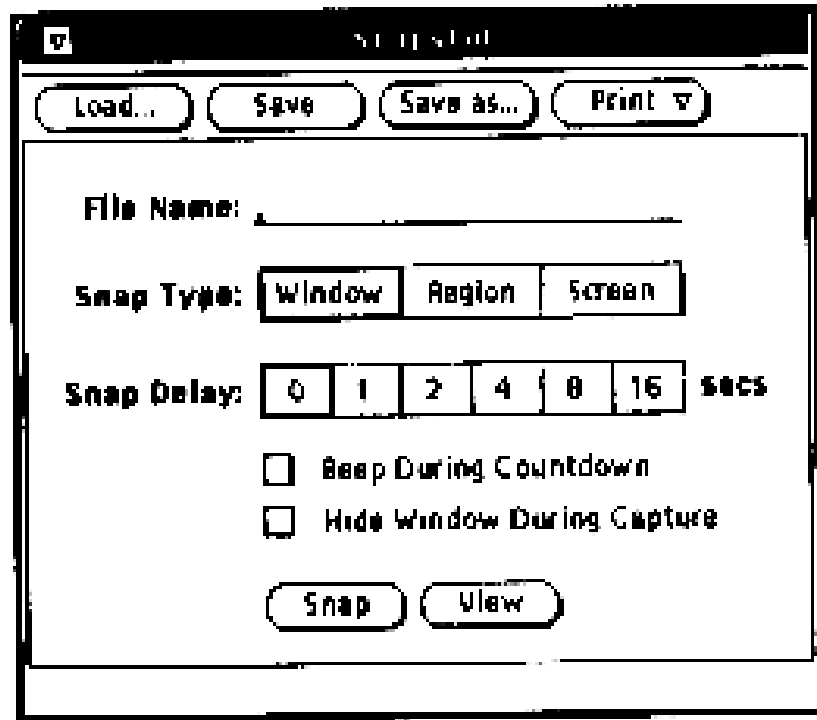
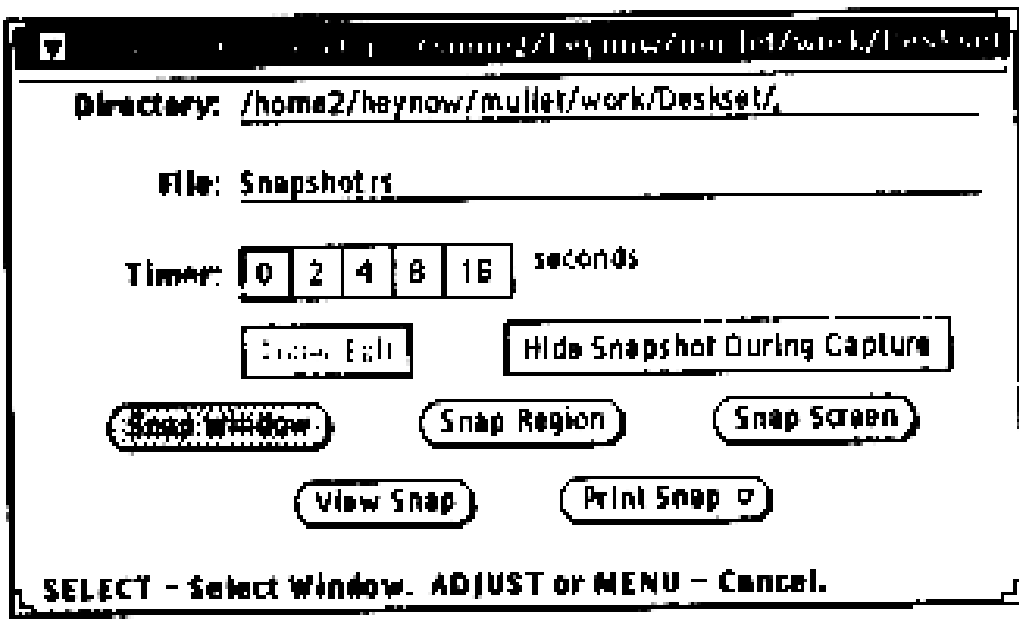
order should follow a user's conceptual model of sequences



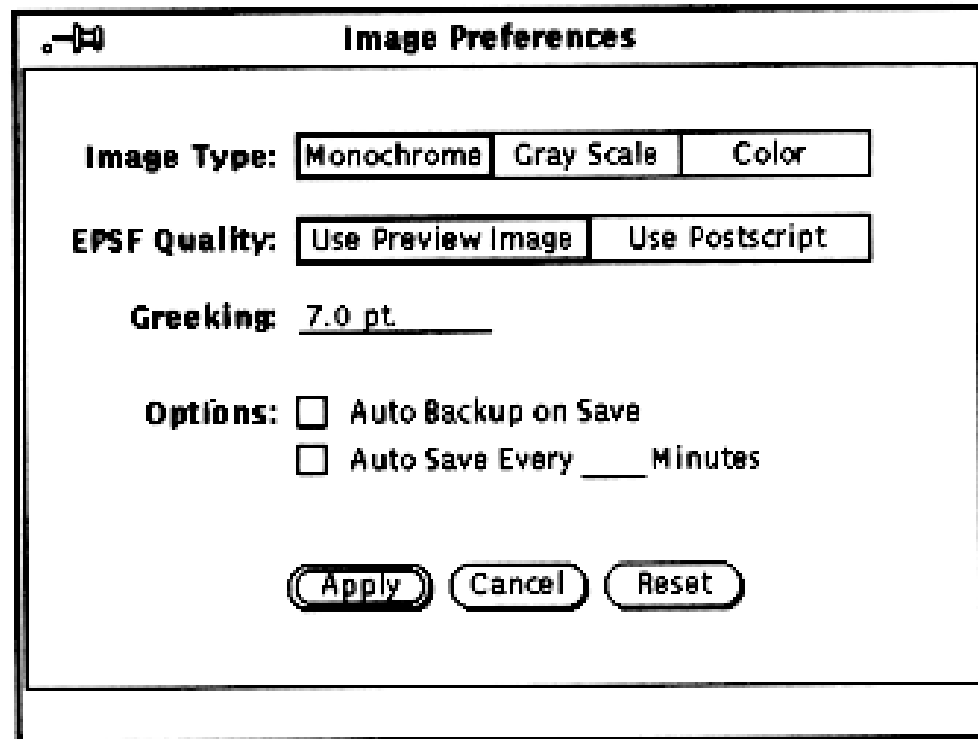
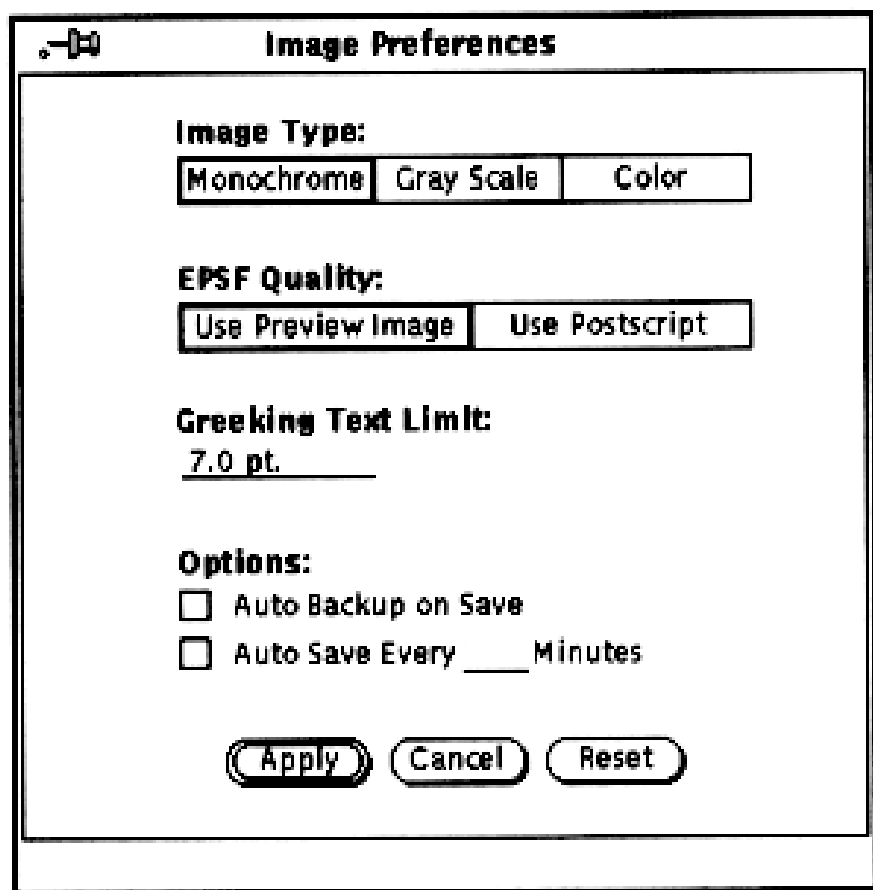
x



✓



Redesigning a layout using alignment and factoring



The importance of negative space and alignment

Economy of visual elements

minimize number of controls

include only those that are necessary

- eliminate, or relegate others to secondary windows

minimize clutter

- so information is not hidden

A diagram of a form layout with a yellow background and a black border. At the top center is the label **MMMM**. Below it are four rows of labels: "xxx: ____" followed by "xxx: ____". The first two rows have labels on both the left and right, while the last two rows have labels only on the left. Below the labels are two rows of rounded rectangular input fields. The first row has four fields, and the second row has three fields. At the bottom center is the label **NNNN**. Below it are two rows of labels: "xxx: ____" followed by "xxx: ____". The first row has labels on both the left and right, while the second row has labels only on the left. Below the labels is a row of three rounded rectangular input fields.

x

A diagram of a form layout with a yellow background and a black border. At the top center is the label **NNNN**. Below it is the label **MMMM**. Below the label are three rows of labels: "xxx: ____". The first two rows have labels on the left, and the third row has a label on the left and two rounded rectangular input fields on the right.

✓

bugtool properties

Update tool Reset values in properties sheet Update tool and .bugtraqrc file

Configurable Fields

Create	Edit	Create	Edit
<input checked="" type="checkbox"/>	<input type="checkbox"/> Keywords	<input type="checkbox"/>	<input checked="" type="checkbox"/> Evaluation
	<input checked="" type="checkbox"/> Responsible Manager	<input type="checkbox"/>	<input checked="" type="checkbox"/> Commit to fix
<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/> Responsible Engineer	<input type="checkbox"/>	<input checked="" type="checkbox"/> Fixed in
<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/> Work Around	<input type="checkbox"/>	<input checked="" type="checkbox"/> Integrated in
<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/> Suggested fix	<input type="checkbox"/>	<input type="checkbox"/> Verified in
<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/> Comments	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/> Closed because
<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/> See also	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/> Incomplete because
<input type="checkbox"/>	<input type="checkbox"/> Hook 1	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/> Submitter
<input type="checkbox"/>	<input type="checkbox"/> Hook 2	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/> Dispatch operator
<input type="checkbox"/>	<input checked="" type="checkbox"/> Root Cause	<input type="checkbox"/>	<input type="checkbox"/> Evaluator
<input type="checkbox"/>	<input checked="" type="checkbox"/> Fix affects documentation	<input type="checkbox"/>	<input type="checkbox"/> Commit operator
<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/> Interest list	<input type="checkbox"/>	<input type="checkbox"/> Fix operator
<input type="checkbox"/>	<input type="checkbox"/> Patch Id	<input type="checkbox"/>	<input type="checkbox"/> Integrating operator
<input type="checkbox"/>	<input checked="" type="checkbox"/> Company	<input type="checkbox"/>	<input type="checkbox"/> Verify operator
<input type="checkbox"/>	<input checked="" type="checkbox"/> Employee	<input type="checkbox"/>	<input type="checkbox"/> Closeout operator
<input type="checkbox"/>	<input checked="" type="checkbox"/> OS version	<input type="checkbox"/>	<input type="checkbox"/> Duplicate of
<input type="checkbox"/>	<input type="checkbox"/> SO number	<input type="checkbox"/>	<input type="checkbox"/> Old name
<input type="checkbox"/>	<input type="checkbox"/> Sun contact	<input type="checkbox"/>	<input type="checkbox"/> Change log

Default Field Values

Category... deskset
 Subcategory... filemgr
 Release... 3.0w_prefs
 Hardware ... sun4c_75
 OS version... 4.1.1reub

Priority:

1	2	3	4	5
1	2	3	4	5

 Severity:

1	2	3	4	5
1	2	3	4	5

 Bug/Rfn:

bug	rfe
-----	-----

 Responsible engineer: _____
 Company: Sun Microsystems, Inc. _____
 Employee: _____
 Sun contact: _____
 Cc: _____
 Miscellaneous: _____
 Number of r: 30 5 4
 Text subw: _____
 Auto upda: _____
 View wind: _____
 Start in mo: _____
 BugTraq s: _____
 Server me: _____

(a)

(b)

Bugtool: Properties

Category: ☒ Default Submission Info

Hardware Model: ☒ SPARCstation SLC

OS Version: ☒ SunOS 4.1

Window System: ☒ OW 3.0

Company: _____

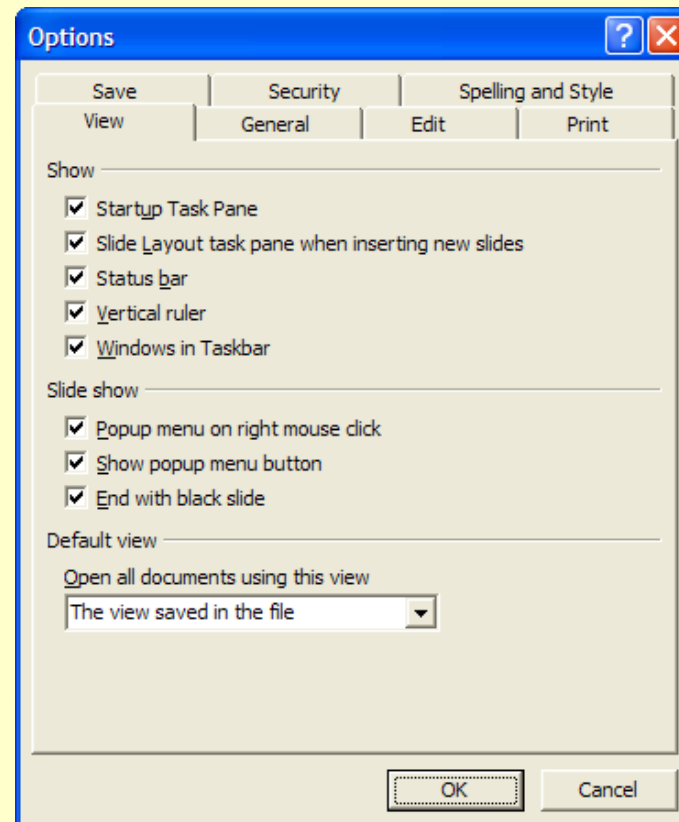
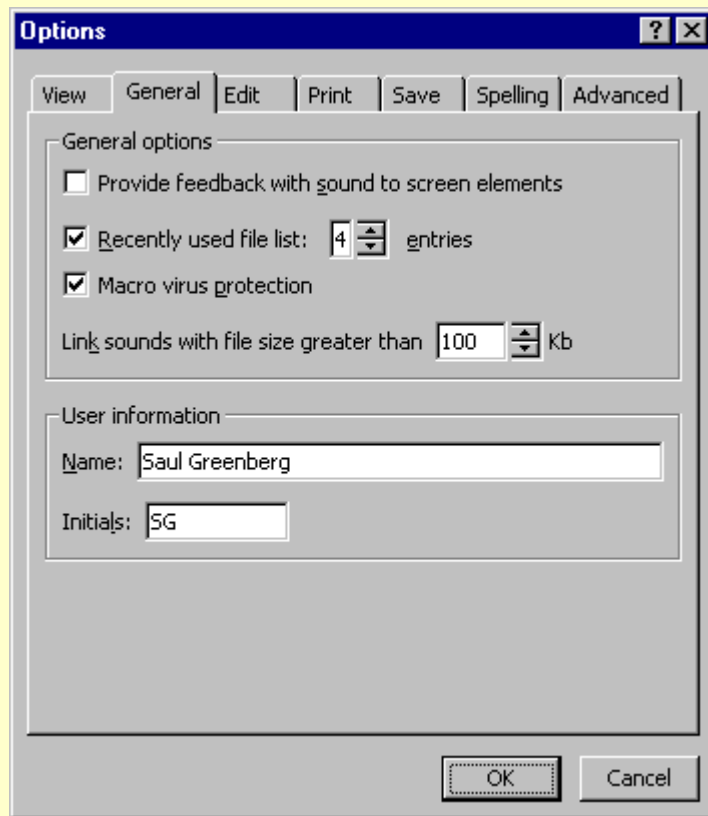
Employee: _____

SalesOffice: _____

Sun Contact: _____

Apply Reset

Repairing excessive display density



Tabs

- excellent means for factoring related items
- but can be overdone

Legibility and readability

Characters, symbols, graphical elements should be easily noticable and distinguishable

Text set in
Helvetica

TEXT SET IN
CAPITOLS

Text set in
Times Roman

TEXT SET IN
BRAGGADOCIO

Text set in
Courier



Legibility and readability

Proper use of typography

- 1-2 typefaces (3 max)
- normal, italics, bold
- 1-3 sizes max

Large

Medium

Small

Readable

Design components to be
inviting and attractive

Design components to be
inviting and attractive



Large

Medium

Small

Unreadable

Design components to be
inviting and attractive

Design components to be
inviting and **attractive**



Legibility and readability

typesetting

- point size
- word and line spacing
- line length
- Indentation
- color

Readable

Design components to be inviting and attractive

Design components to be inviting and attractive



Unreadable: Design components to be easy to interpret and understand. Design components to be inviting and attractive



Whenever your local SMS Administrator sends you an actual software Package, the SMS Package Command Manager will appear (usually at network login time) displaying the available Package(s). The following screenshots display scenes similar to what you will see when you receive an actual SMS Package.

To start the demonstration, click the "CLICK HERE" button of the screen.

If you wish to add/change network information, please select one of the following options.

- ☒ I WANT TO CONNECT TO AN EXISTING TIME & CHAOS WORKGROUP OR MODIFY THE CONNECTION SETTINGS.
- ☐ I WANT TO BUILD A BRAND NEW WORKGROUP.

These choices must be really important, or are they?

Greyed-out example text hard to read.
Why not make it black?

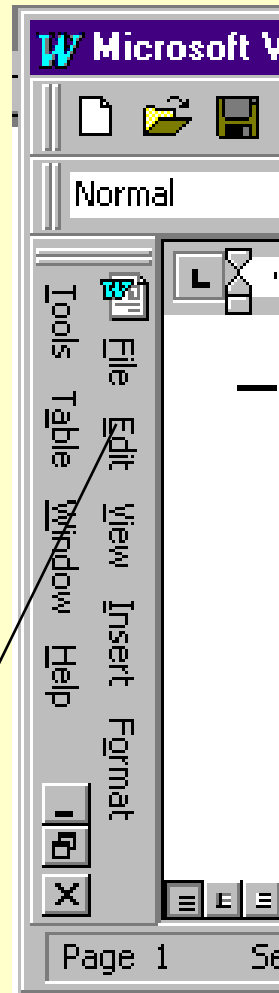
Appearance samples

Positive:	\$123,456,789.000	Negative:	(\$123,456,789.000)
-----------	-------------------	-----------	---------------------

Currency symbol: \$

No. of digits after decimal: 4

Text orientation
difficult to read



Imagery

Signs, icons, symbols

- right choice within spectrum from concrete to abstract

Icon design *very* hard

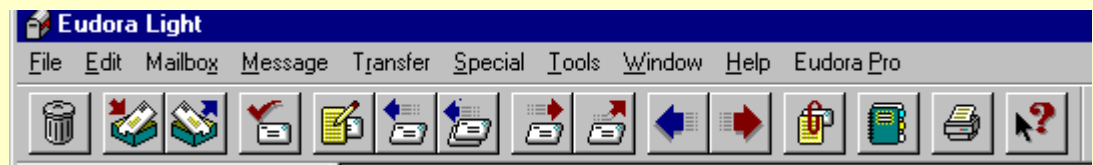
- except for most familiar, always label them

Image position and type should be related

- image “family”

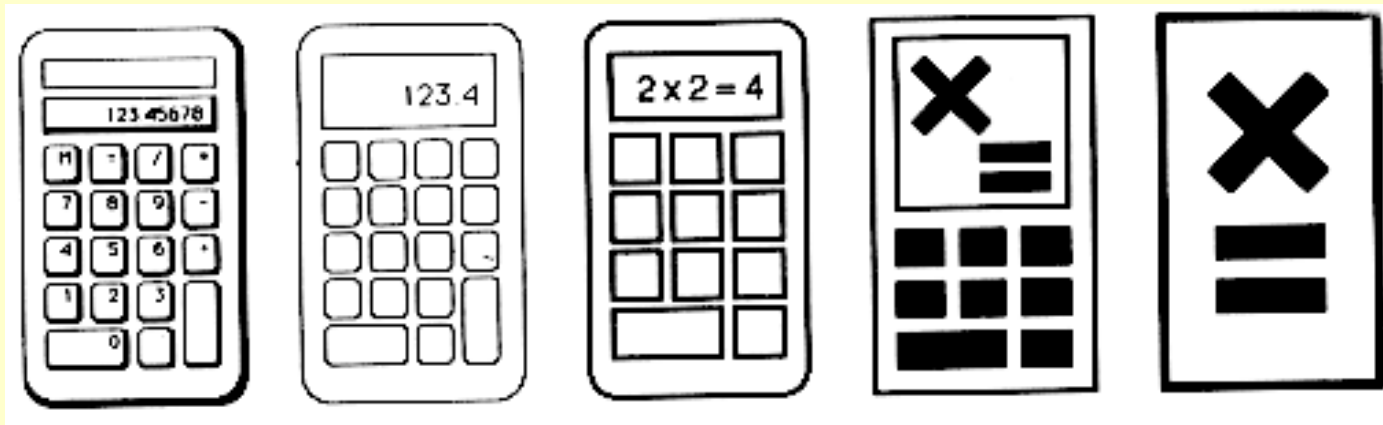
Consistent and relevant image use

- identifies situations, offerings...

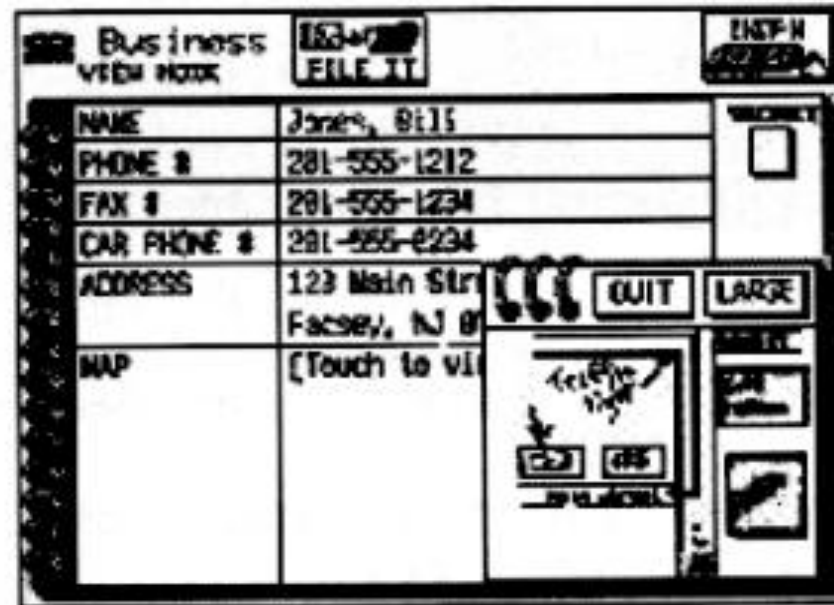
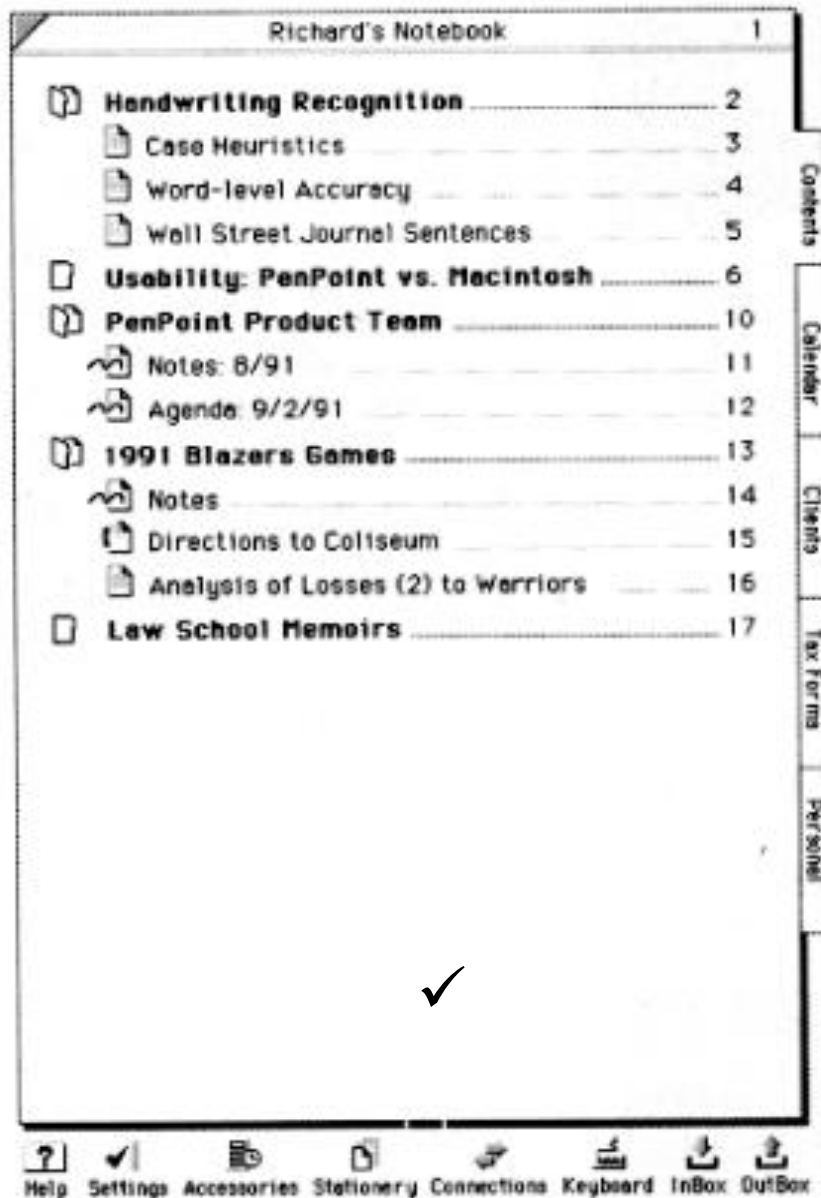


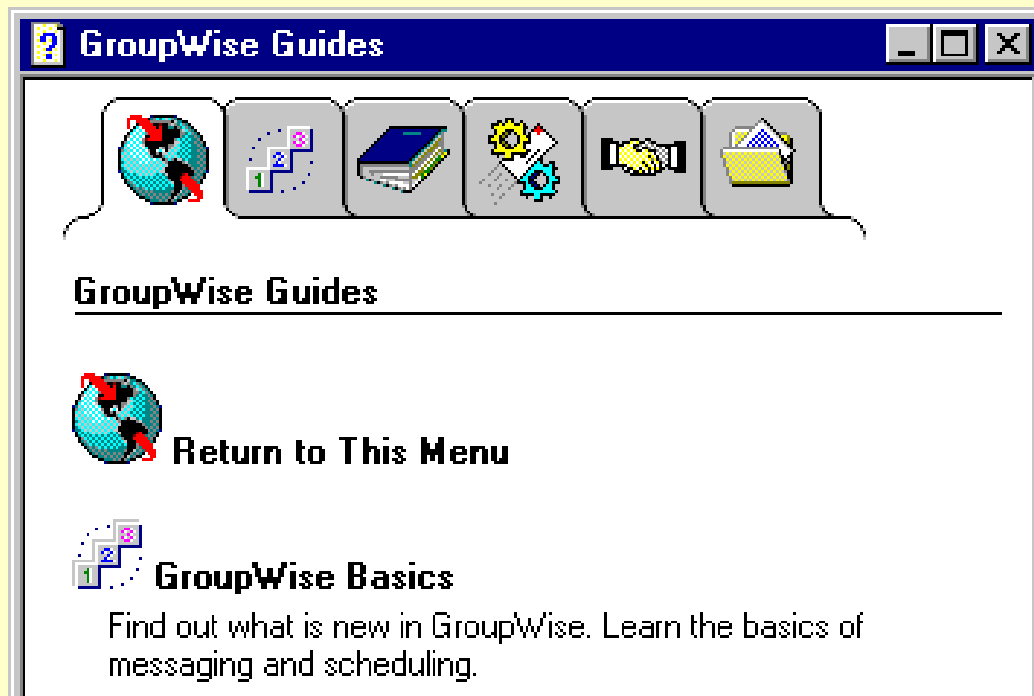
Partial icon family

Choosing levels of abstraction



Refined vs excessive literal metaphors





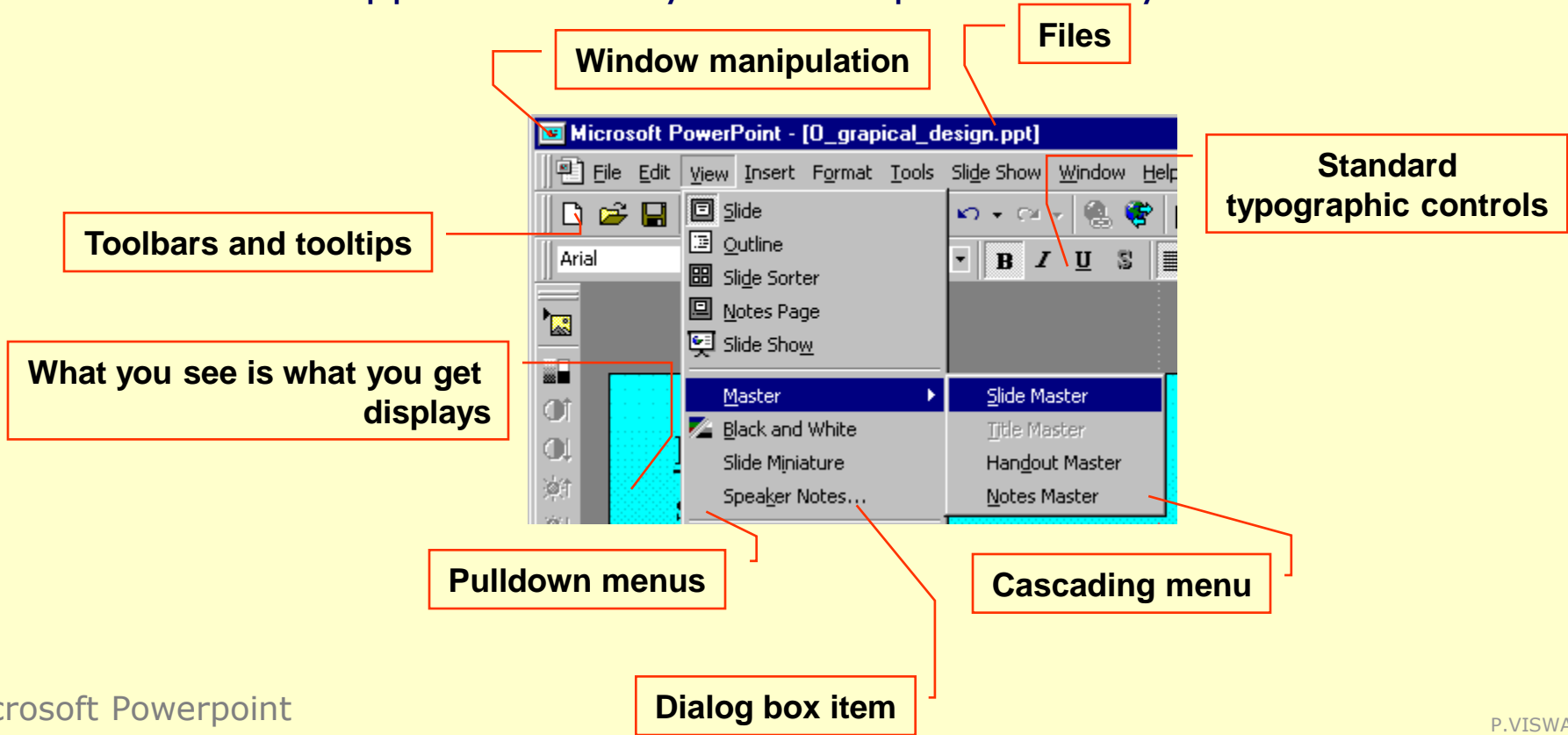
What do these images mean?

- no tooltips included
- one of the tabs is a glossary explaining these images! which one?

Idioms

Familiar ways of using GUI components

- appropriate for casual to expert users
- builds upon computer literacy
- must be applied carefully in walk up and use systems



How to choose between widgets

What components must be in the display?

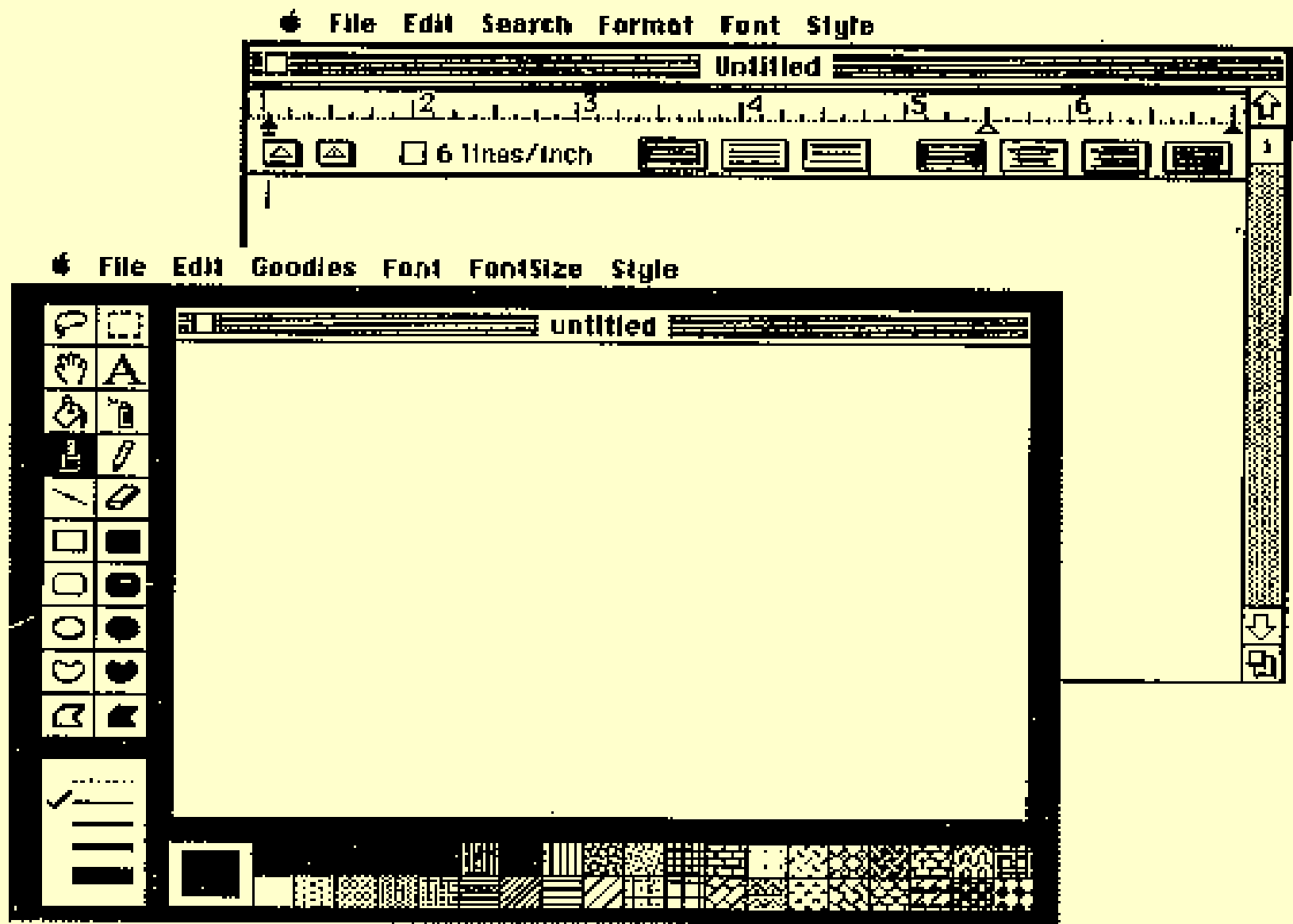
- necessary visual affordances
- frequent actions
 - direct manipulation for core activities
 - buttons/forms/toolbar/special tools for frequent/immediate actions
 - menus/property window for less frequent actions
 - secondary windows for rare actions

How are components related?

- organize related items as “chunks”

What are familiar and expected idioms?

- cross application look and feel

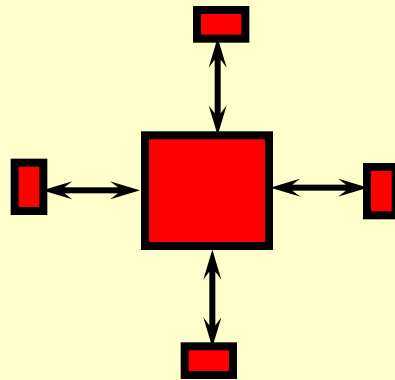


Displaying core functionality

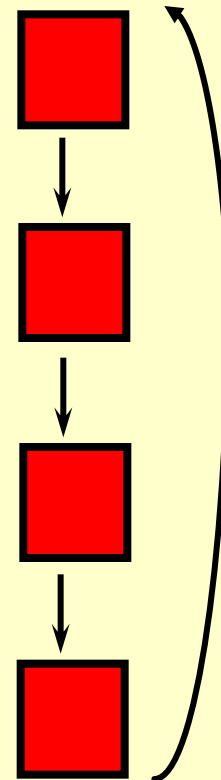
Widgets and complexity

how can window navigation be reduced?

- avoid long paths
- avoid deep hierarchies



✓



x

Exercise

Graphical redesign

Create a grid emphasising:

- visual consistency
- relationships between screen elements
- navigational cues
- economy
- legibility and readability
- imagery

Slide Show Options

Timer

☐ Wait for Click

☐ Timer

Seconds _____

Options

☐ Loop Mode

☐ Random Overlay

☐ Fit in Window

☐ Show Menu Bar

Sound

Play Sound

Choose Sound File...

OK

Cancel

Sort

Sort By...

Caption ▾

Direction

☐ Ascending

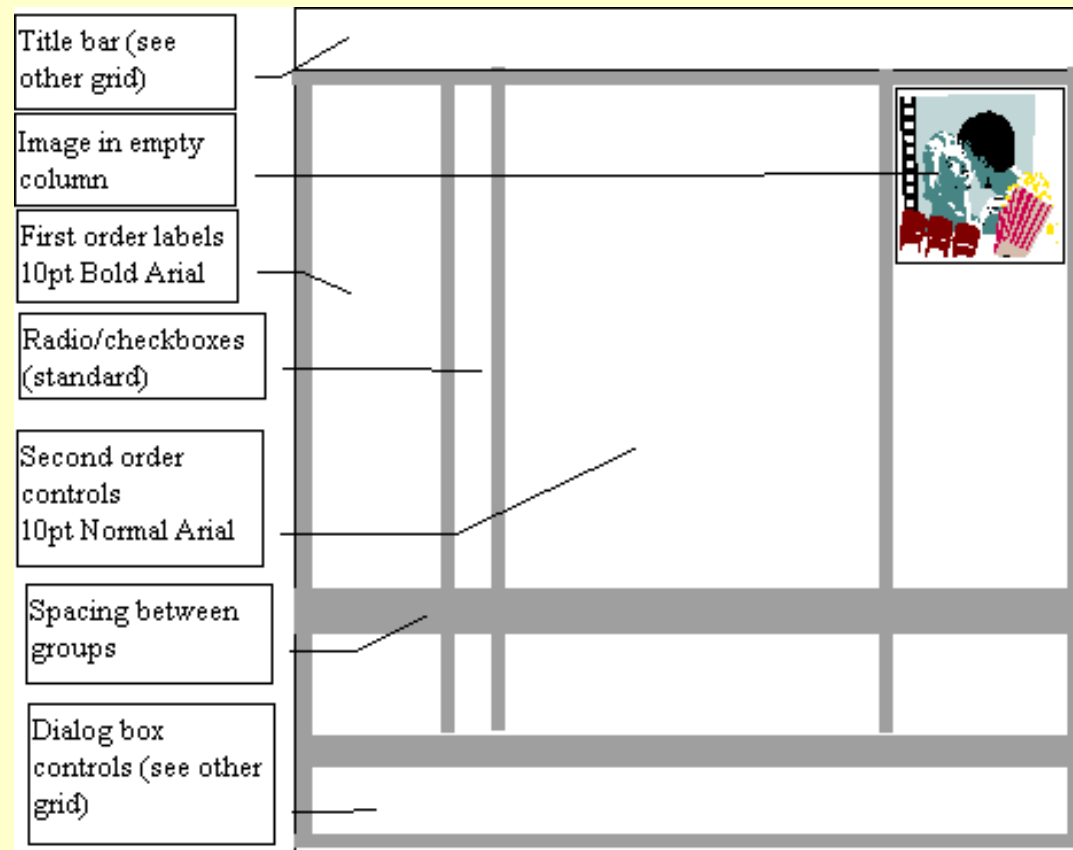
☐ Descending

Done

Cancel

Constructing a grid

1. Maintain consistency with GUI style
 - locate standard components - title bar, window controls, ...
2. Decide navigational layout + white space + legibility + typography
 - annotated grid shows location of generic components
 - these generic components may have their own grids.



Using the grid


3. Determine relationships, navigational structure

- map navigational structure onto the grid

4. Economize

- collapse two windows into one
- trim sound dialog

Slide Show Options

Timer	<input checked="" type="radio"/> click <input type="radio"/> __5 seconds	
Options	<input type="checkbox"/> loop mode <input type="checkbox"/> random overlay <input type="checkbox"/> fit in window <input type="checkbox"/> show menu bar	
Sound	None <input type="button" value="Browse"/>	
Sort by	None ▼ <input checked="" type="radio"/> Ascending <input type="radio"/> Descending	

Using the grid

5. Evaluate by displaying actual examples
6. Economize further
 - decide which we prefer


Slide Show Options

Timer ☒ click ☐ 5 seconds

Options ☐ loop mode ☐ random overlay ☐ fit in window ☐ show menu bar

Sound

Sort by
☒ Ascending ☐ Descending



VS

Slide Show Options

Timer ☒ click ☐ 5 seconds

Options ☐ loop mode ☐ random overlay ☐ fit in window ☐ show menu bar

Sound

Sort by
☒ Ascending ☐ Descending

What you now know

CRAP

Grids are an essential tool for graphical design

Other visual concepts include

- visual consistency
 - repetition
- visual organization
 - contrast, alignment and navigational cues
- visual relationships
 - proximity and white space
- familiar idioms
- legibility and readability
 - typography
- appropriate imagery

Interface Design and Usability Engineering

