Presentation:
Designing GUI visual components
IAT351

Week 8 Lecture 1

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Lyn Bartram

lyn@sfu.ca

Many slides adapted from Saul Greenberg, CS 481, University of Calgary

Administrivia

- Shift in focus
- DESIGN AND PLAN BEFORE YOU BUILD
- TSSU and you (and me)
- Final project ideas this week

In a (code) hole???

- Plan before you dig..er..code
- DESIGN your architecture before you build it
- Write your design doc BEFORE your application

Let's review: GUI characteristics

Characteristic	Function
Windows	Multiple windows allow different information to be displayed simultaneously on the user's screen.
Icons	Icons different types of information. On some systems, icons represent files; on others, icons represent processes.
Menus	Commands are selected from a menu rather than typed in a command language.
Pointing (direct manipulation)	A pointing device is used for selecting choices from a menu or indicating items of interest in a window.
Graphics	Graphical elements can be mixed with text on the same display.

Interaction style	Main advantages	Main disadvantages	Application examples
• Direct manipulation	• Fast and intuitive interaction • Easy to learn	• May be hard to implement • Only suitable where there is a visual metaphor for tasks and objects	• Video games • CAD systems
• Menu selection	• Avoids user error • Little typing required	• Slow for experienced users • Can become complex if many menu options	• Most general-purpose systems
• Form fill-in	• Simple data entry • Easy to learn	• Takes up a lot of screen space	• E-commerce
• Command language	• Powerful and flexible	• Hard to learn • Poor error management	• Operating systems
• Natural language	• Accessible to casual users • Easily extended • Can be Voice	• Requires more typing • Natural language understanding systems are unreliable	• WWW information retrieval systems • Siri

Design principles redux

1. Simple and natural flow
2. Talk the user's language
3. Minimise memory load
4. Design for perception and attention
5. Be consistent
6. Provide feedback
7. Provide exits
8. Provide shortcuts
9. Manage errors
10. Provide help

- Minimise effort
- Minimise surprise!

- Appropriate layout
- Readability
- Imagery
- mistakes

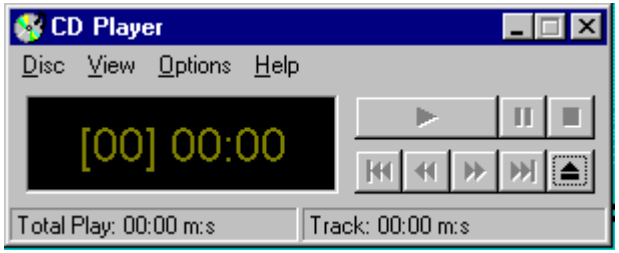
But which user(s)?

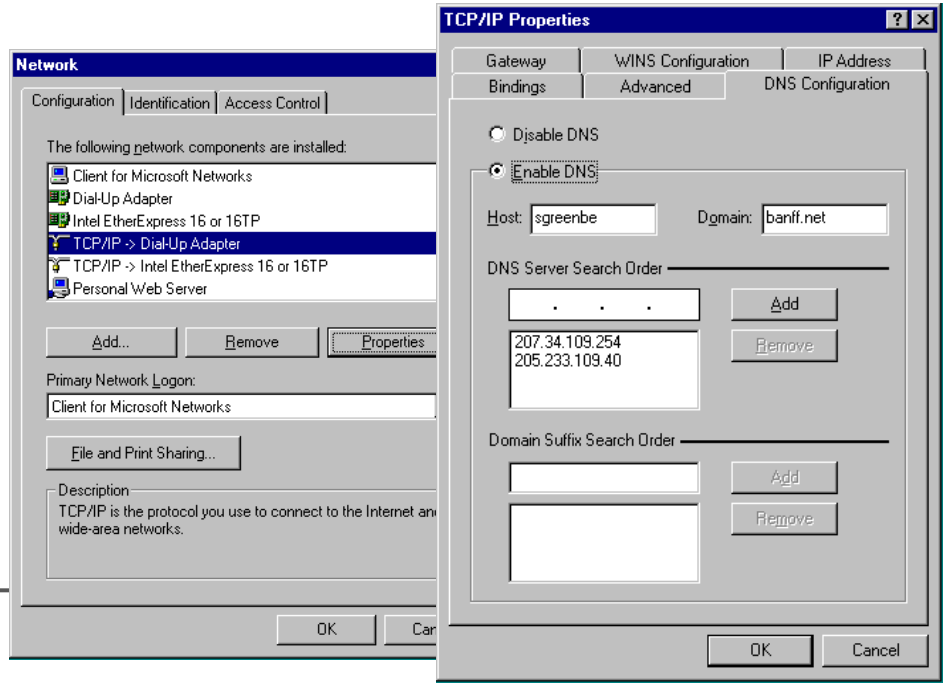
- Novice users vs. experienced users.
  - different behaviour patterns!
- The priority of novice users is
- The priority of experienced users is

- The user interface must provide a balance between quick access to commonly used functions and guidance through less well-known functions.

Simple and natural dialogue: flow

- use the user's conceptual model
- match the users' task sequence
- minimize mapping between interface and task semantics





From Microsoft applications

Simple and natural dialogue

Present exactly the information the user needs

- less is more
  - less to learn, to get wrong, to distract…

information should appear in natural order

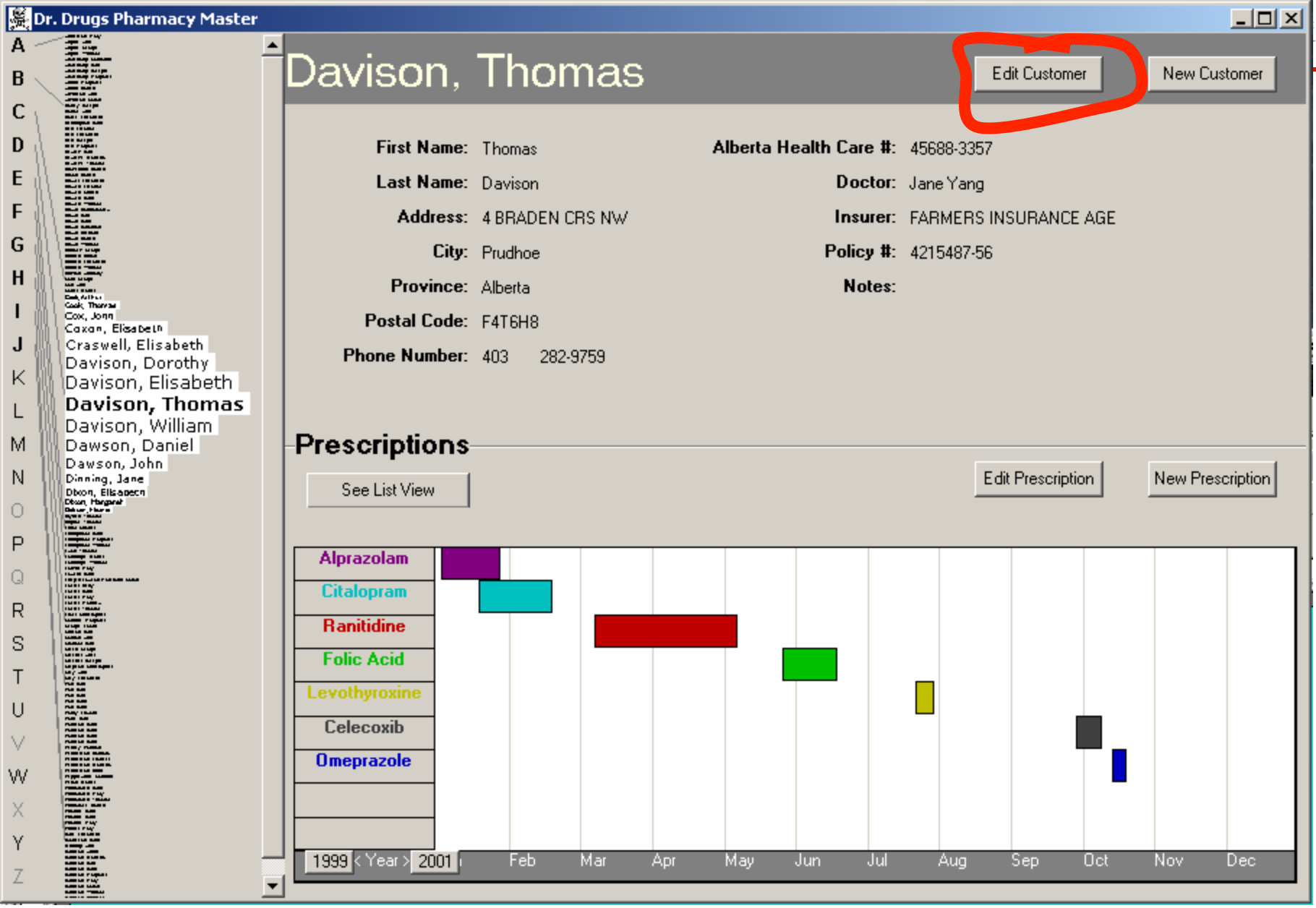
- related information is graphically clustered (*factoring*)
- order of accessing information matches user's expectations

remove or hide irrelevant or rarely needed information

- competes with important information on screen

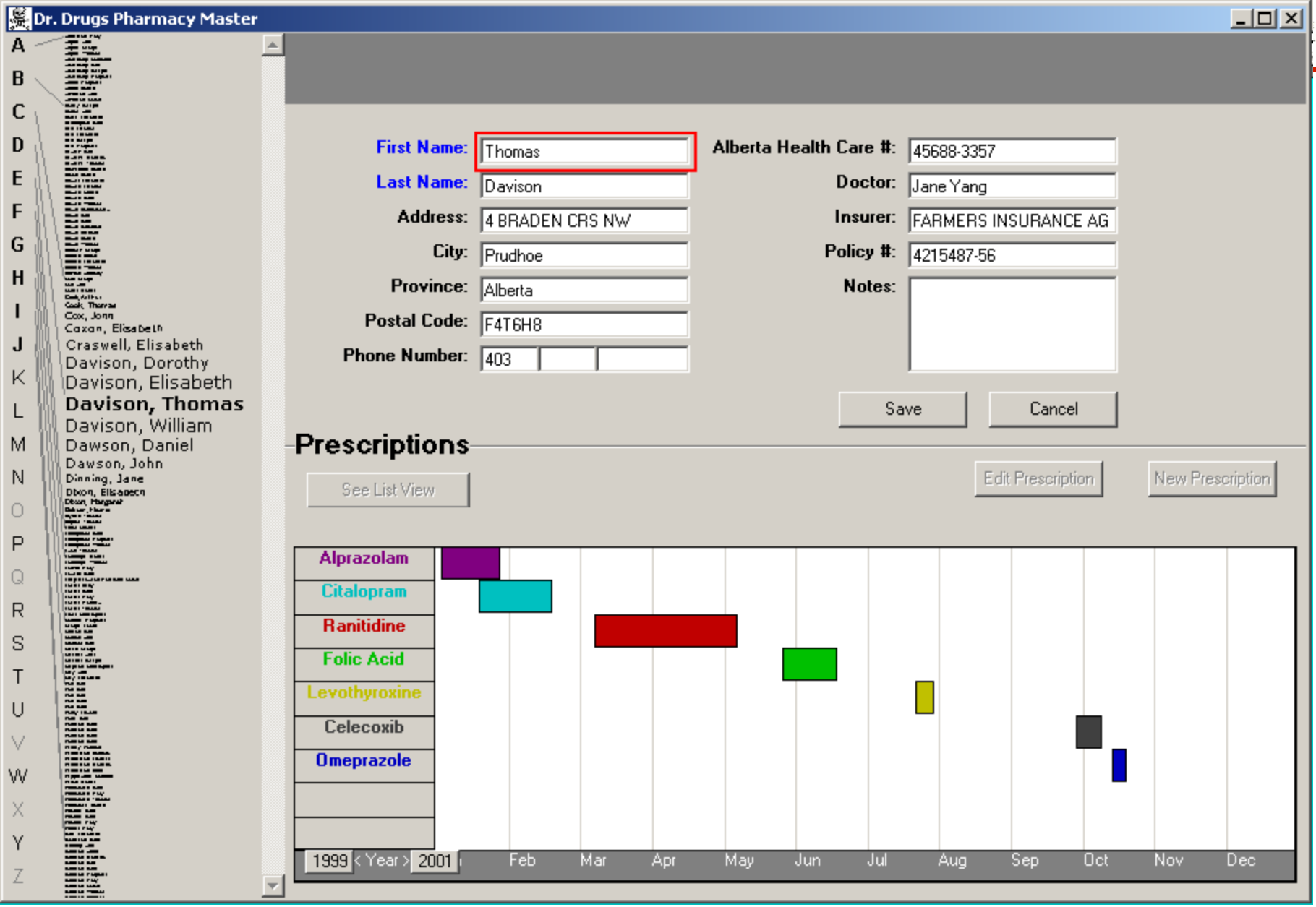
remove modes

- use windows frugally
  - don't add unneeded navigation and window management



Good: information all in the same place

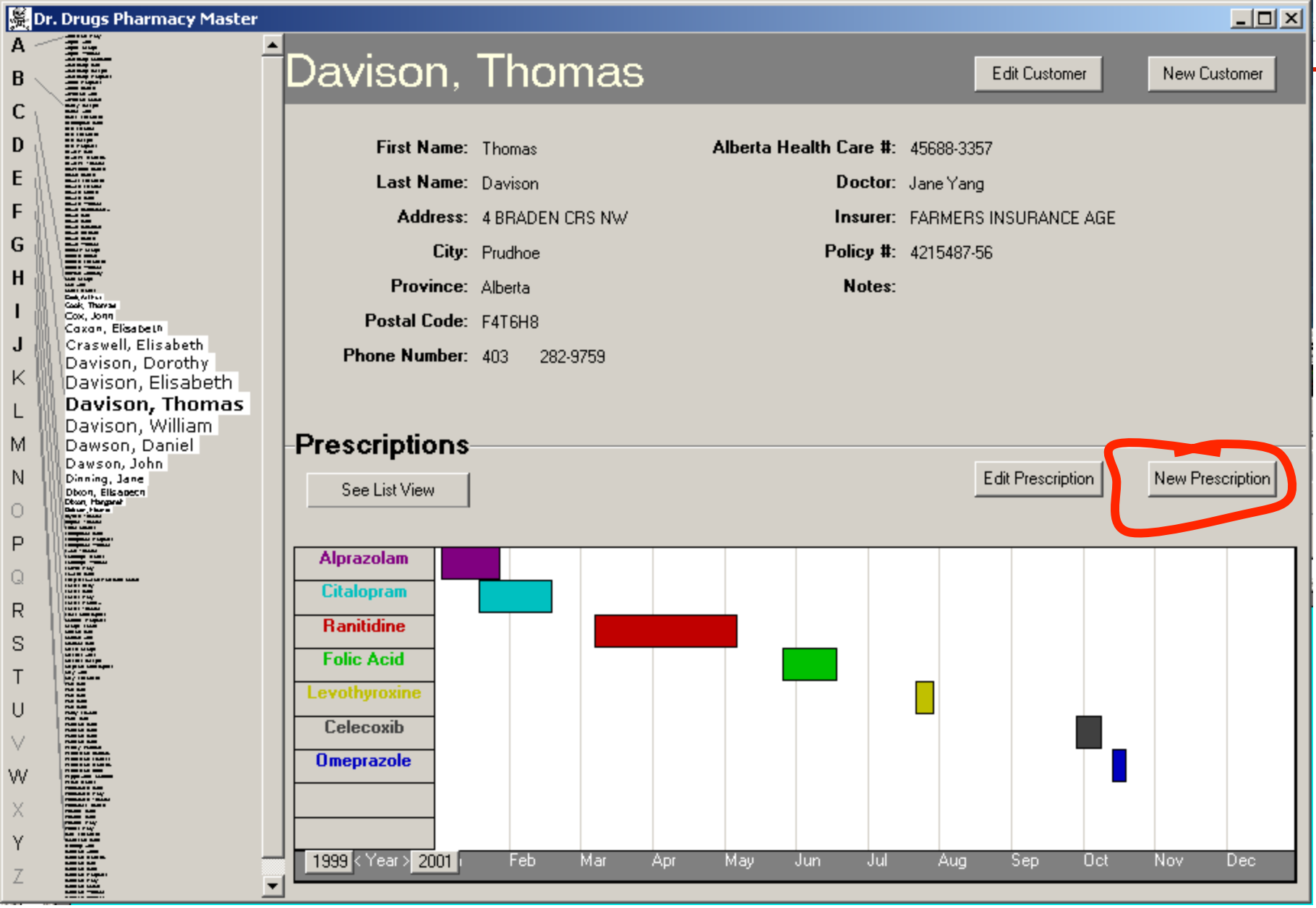
By Saul Greenberg's CS 481 students Brant LeClercq, Lloyd Yoon, Amy Yang (with permission)



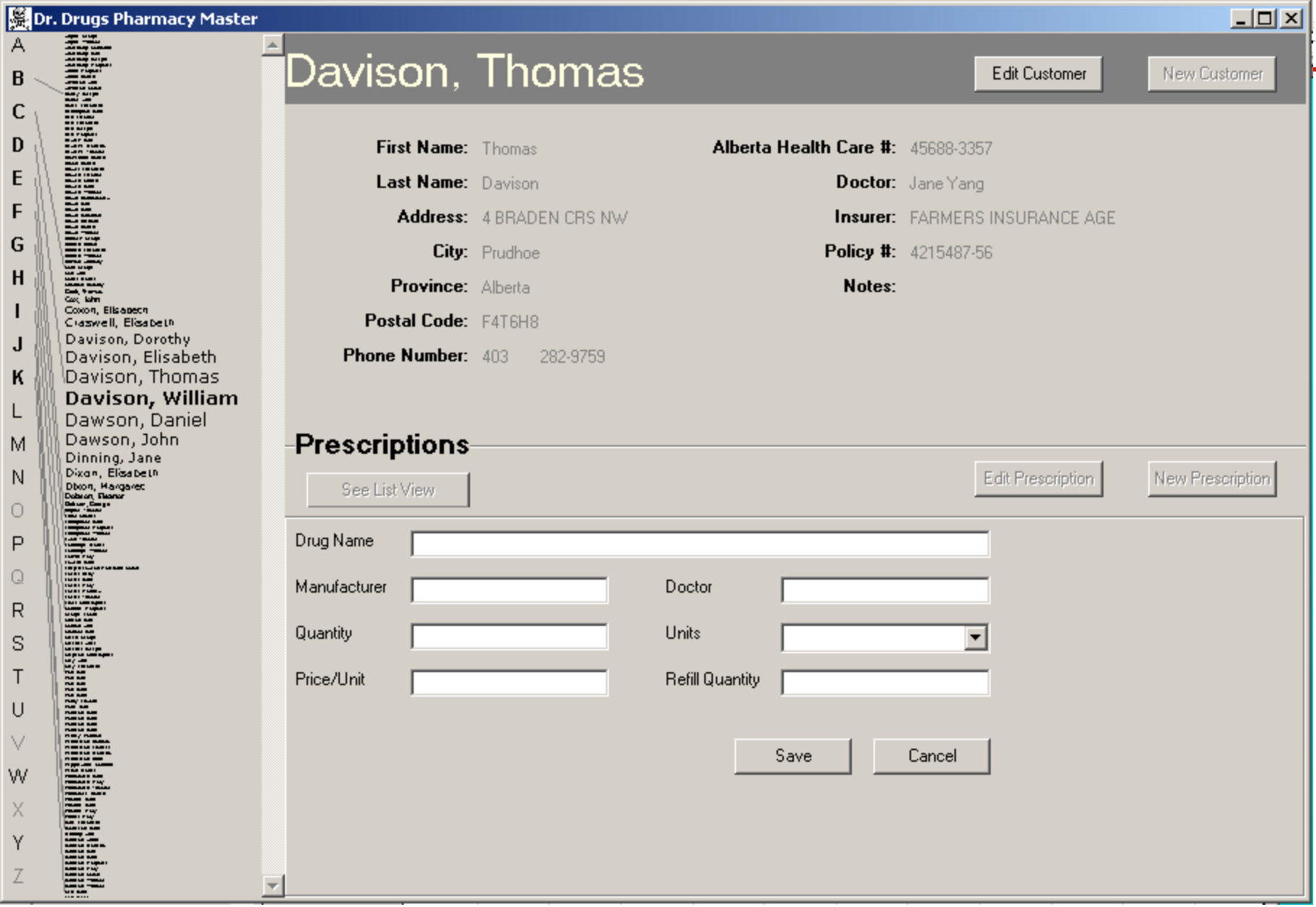
Good: information all in the same place

Bad: special edit mode

By Saul Greenberg's CS 481 students Brant LeClercq, Lloyd Yoon, Amy Yang (with permission)

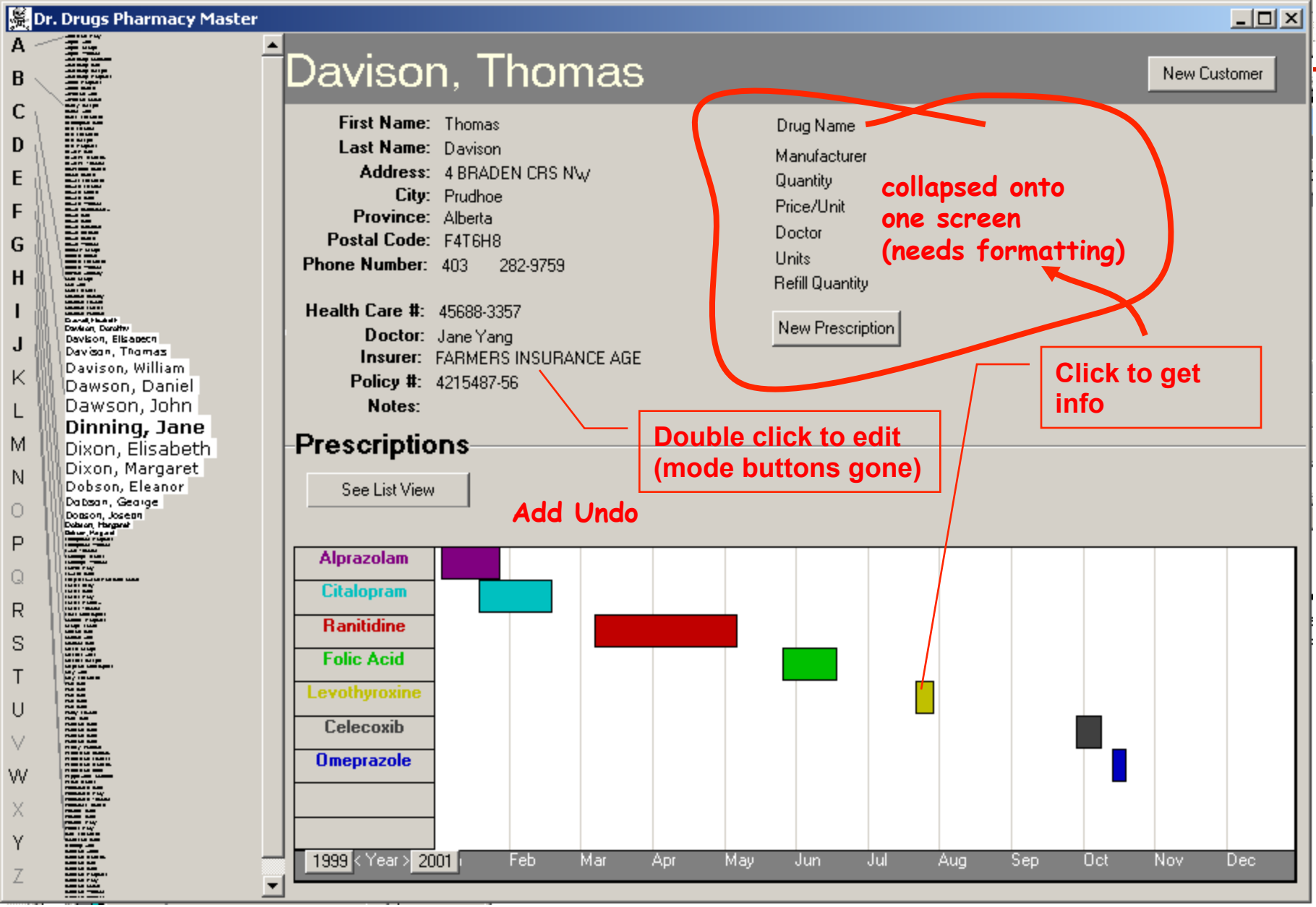


By Saul Greenberg's CS 481 students Brant LeClercq, Lloyd Yoon, Amy Yang (with permission)



Good: Stable parts of the window
Bad: Prescriptions separate from graphics

By Saul Greenberg's CS 481 students Brant LeClercq, Lloyd Yoon, Amy Yang (with permission)



By Saul Greenberg's CS 481 students Brant LeClercq, Lloyd Yoon, Amy Yang (with permission)

Layout and flow

- The screen should be divided into areas that are used consistently for the same purpose, e.g. top for commands and navigation, middle of the screen for input/output.

- The screen should be divided so as to provide natural intuitive flowment , support reading patterns of eye movement and minimize the user's search.

Spatial organisation: grids

Horizontal and vertical lines to locate window components

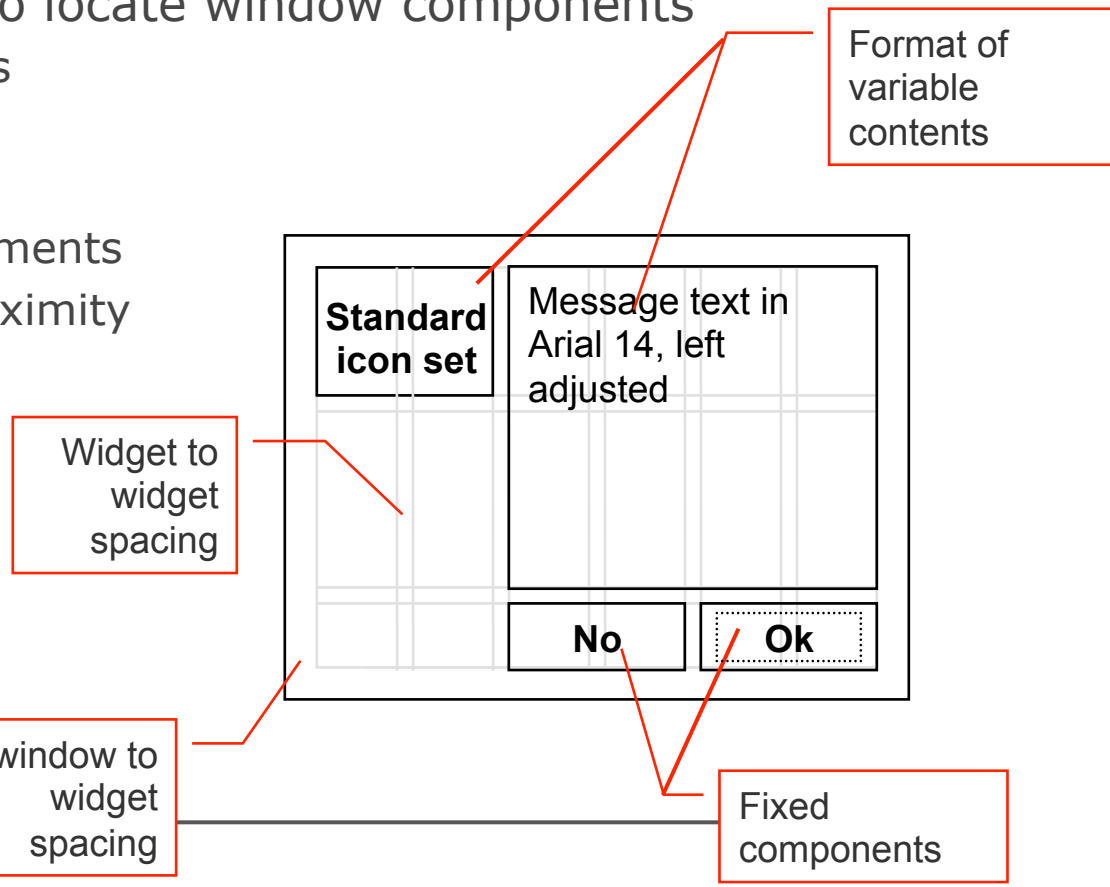
- aligns related components

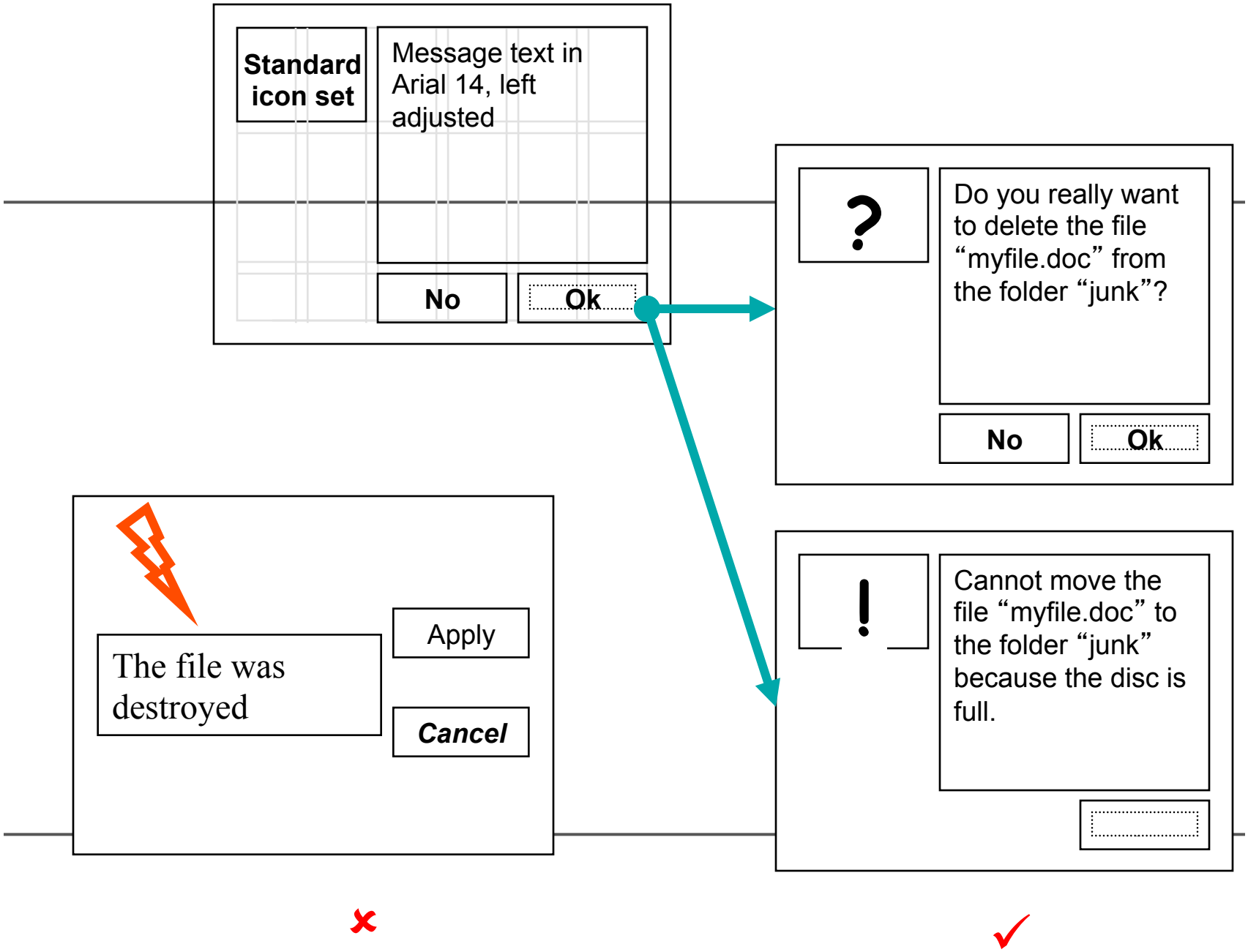
Organization

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

Consistency

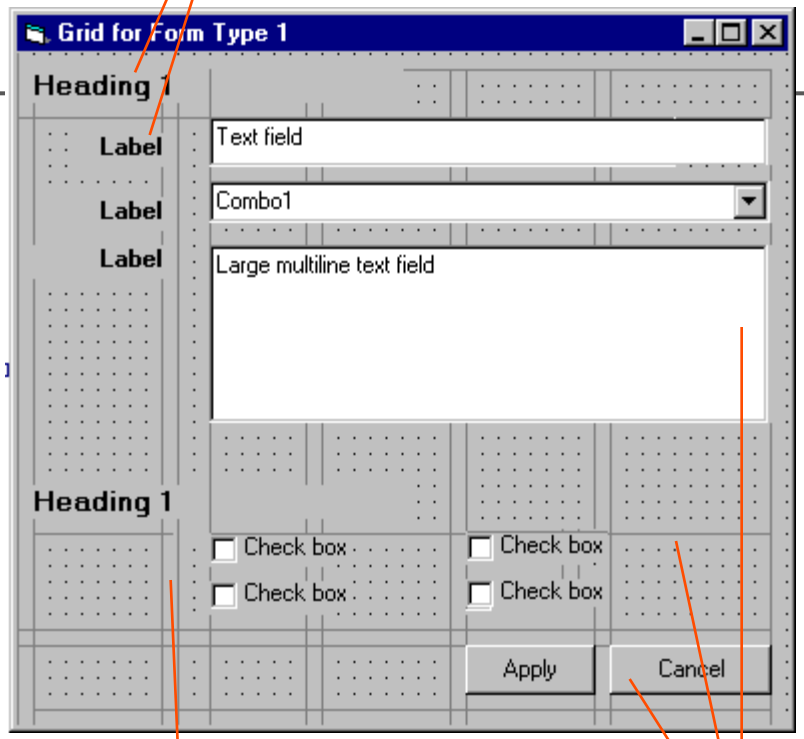
- location
- format
- element repetition
- organization

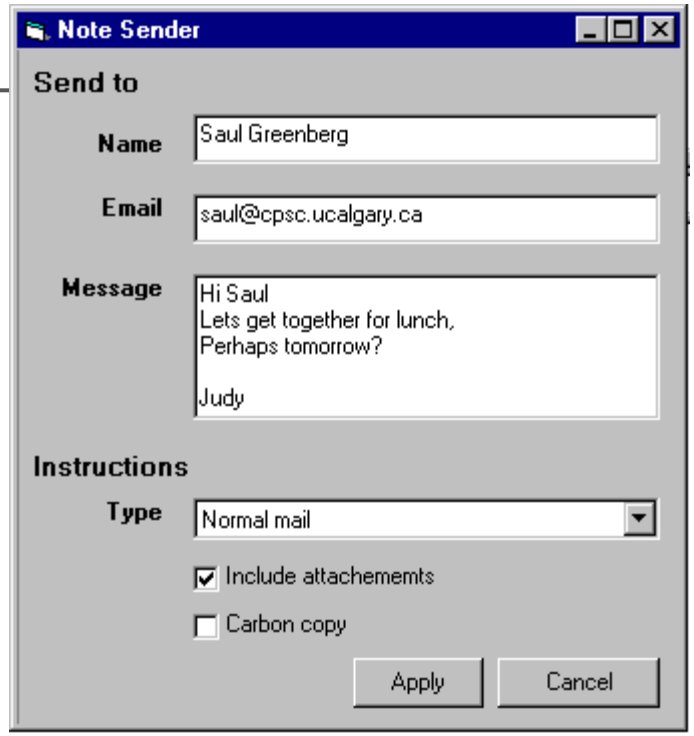



Standard icon set
Message text in Arial 14, left adjusted
No
Ok
?
Do you really want to delete the file “myfile.doc” from the folder “junk”?
No
Ok
The file was destroyed
Apply
Cancel
!
Cannot move the file “myfile.doc” to the folder “junk” because the disc is full.

Two-level Hierarchy
•indentation
•contrast

Logic of organizational flow



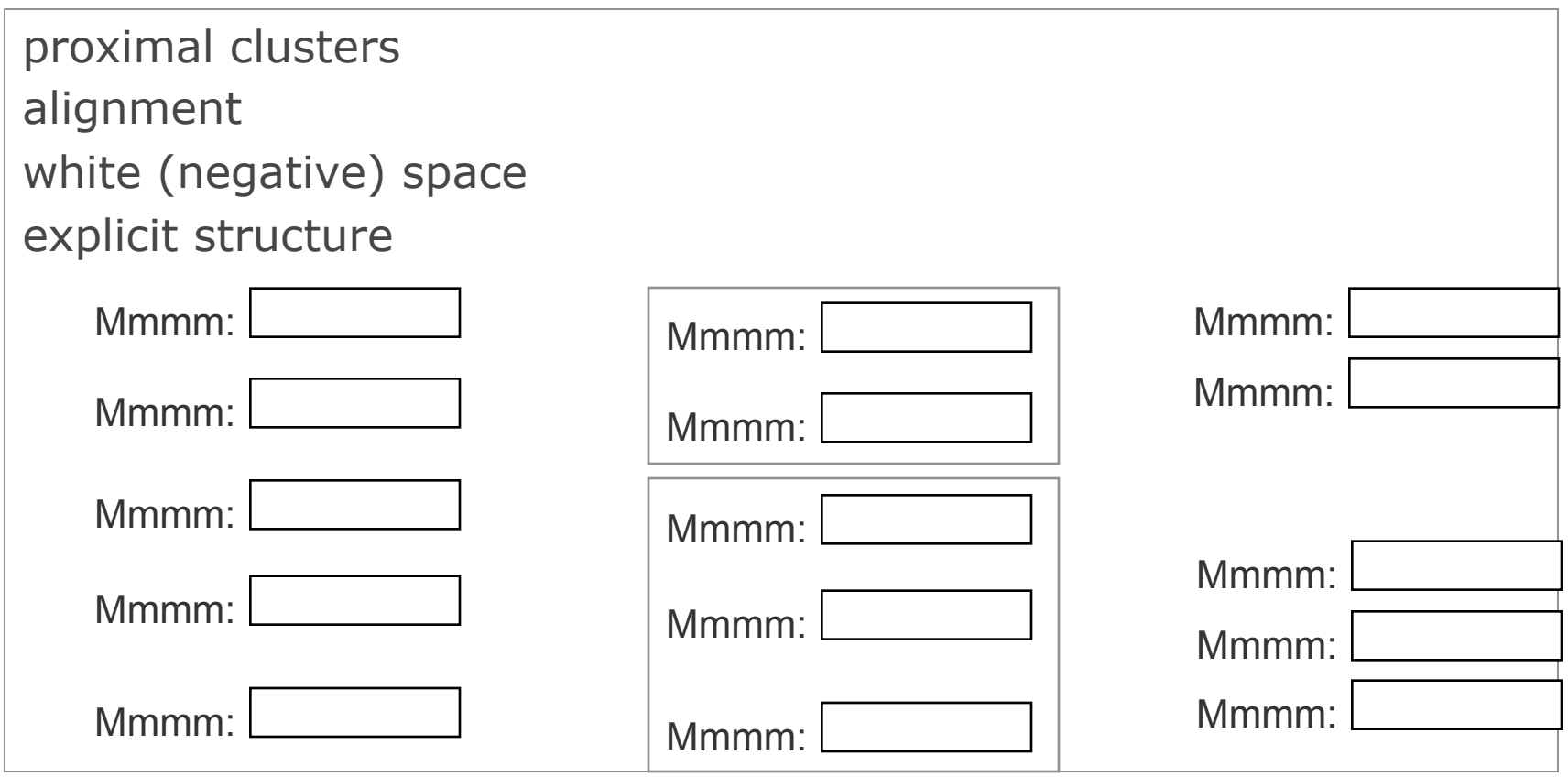


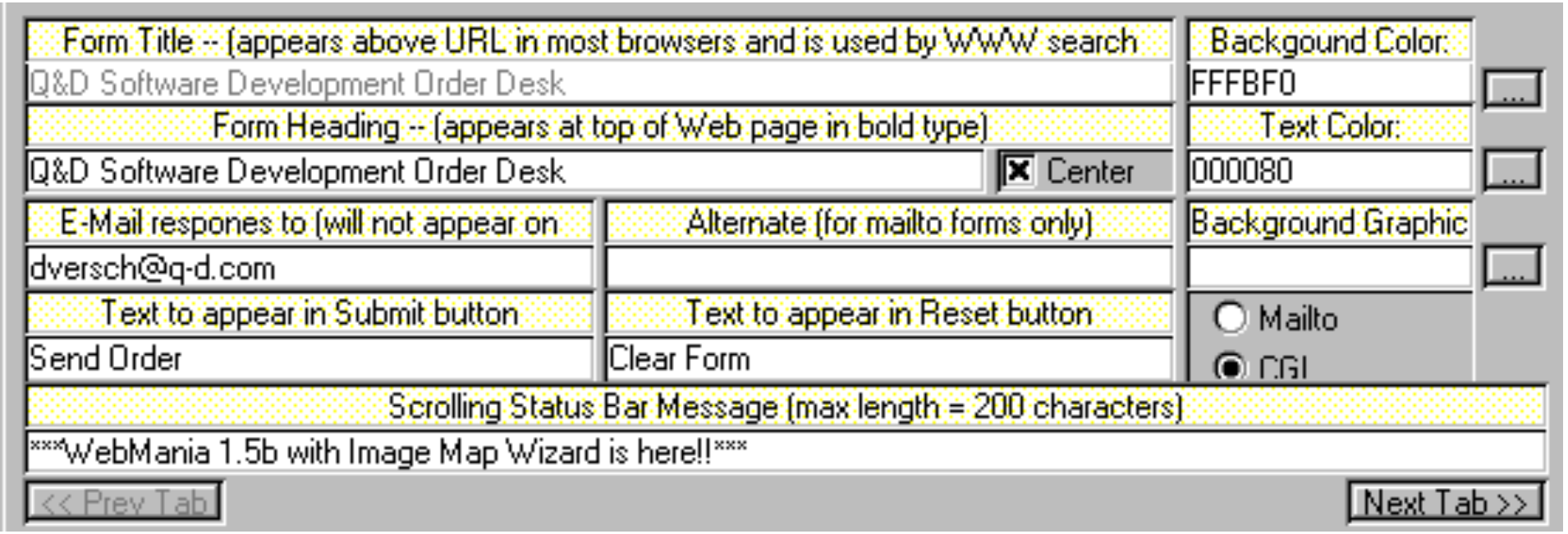
Alignment connects visual elements in a sequence

Grouping by white space

Layout: Relating screen elements

proximal clusters
alignment
white (negative) space
explicit structure





Terrible alignment

- no flow

Poor contrast

- cannot distinguish colored labels from editable fields

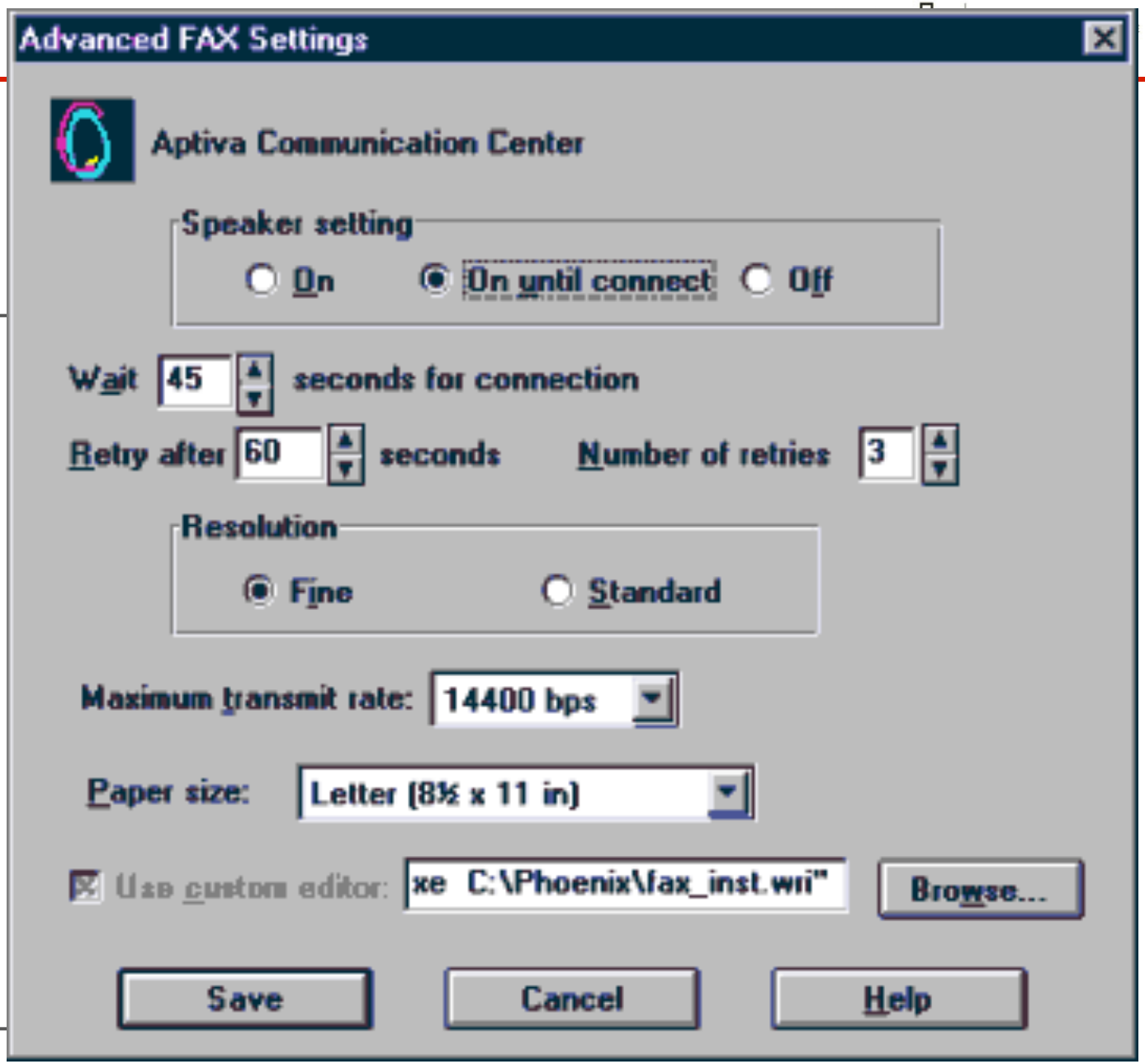
Poor repetition

- buttons do not look like buttons

Poor explicit structure

- blocks compete with alignment

No regard for order and organization



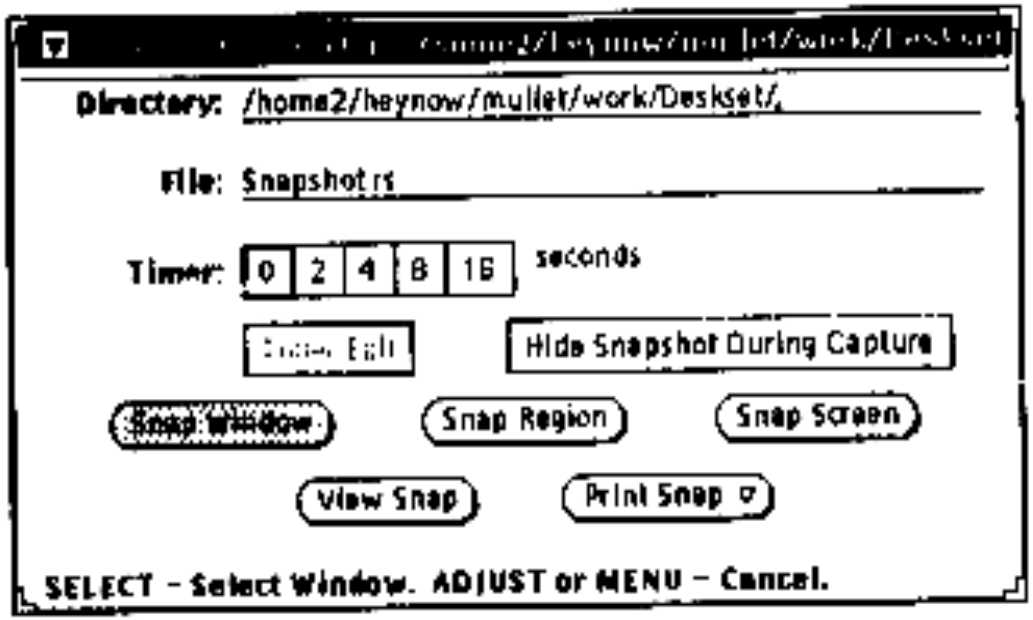
Factoring

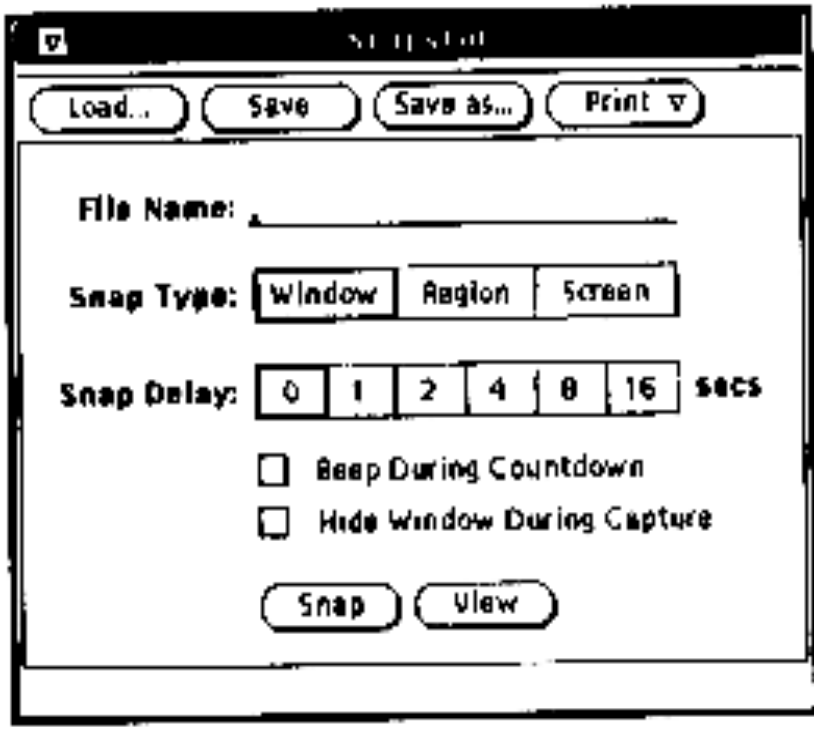
- Principle of visual organisation
- Group elements and actions together in hierarchical, logical structures

- Hide away unnecessary detail

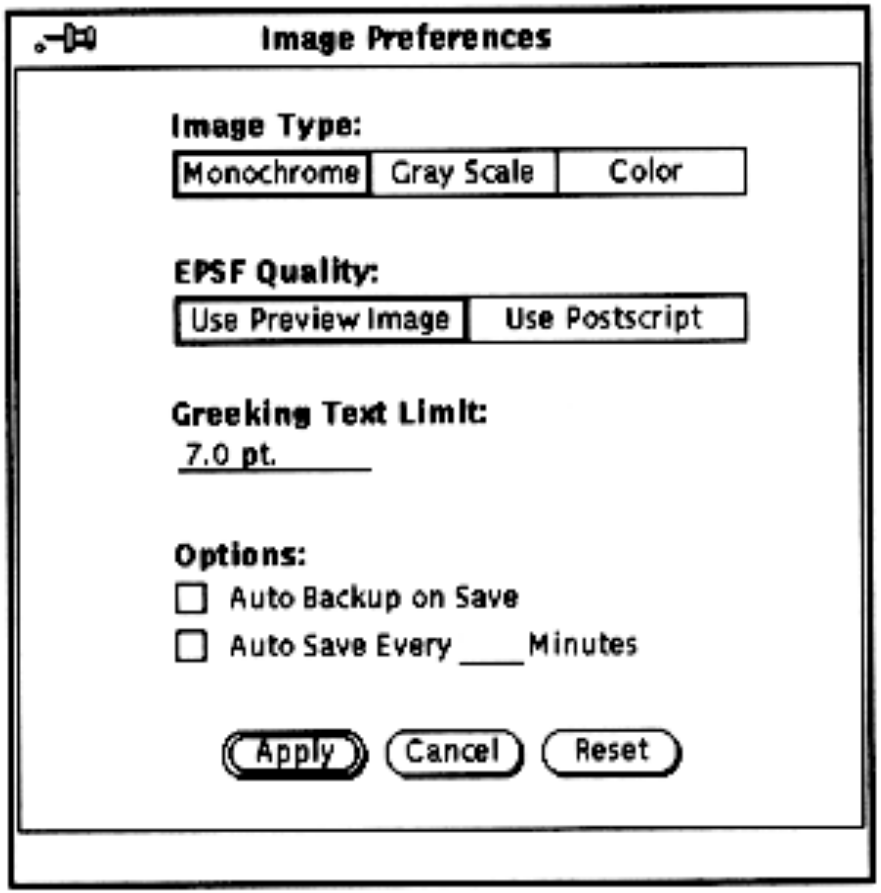
- Facilitate finding more information

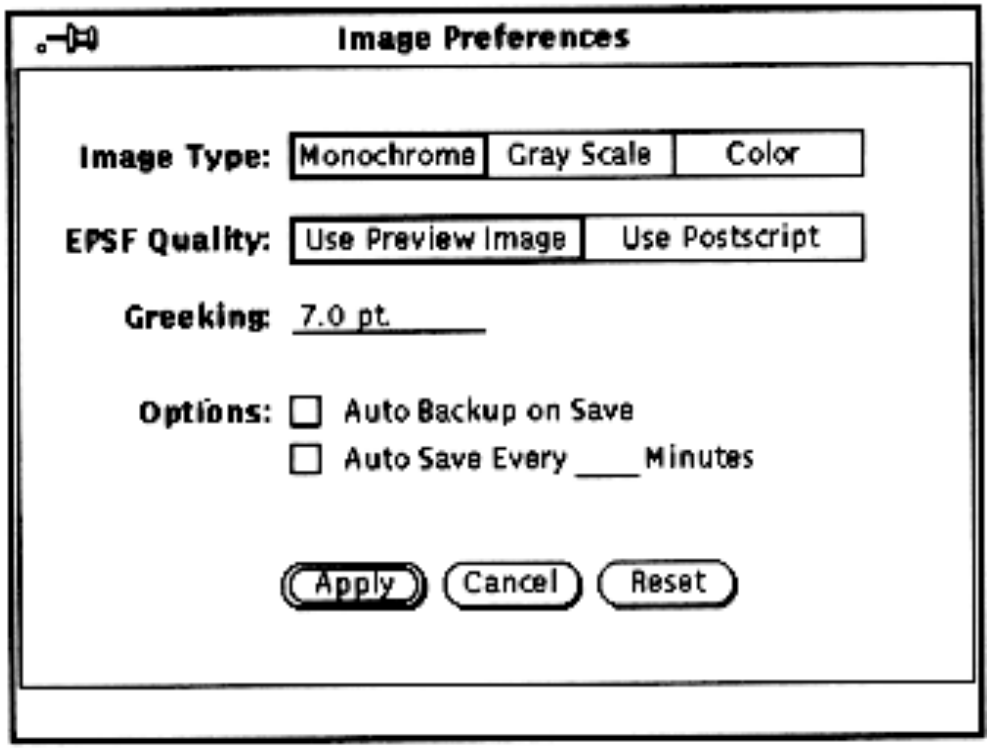
Factoring





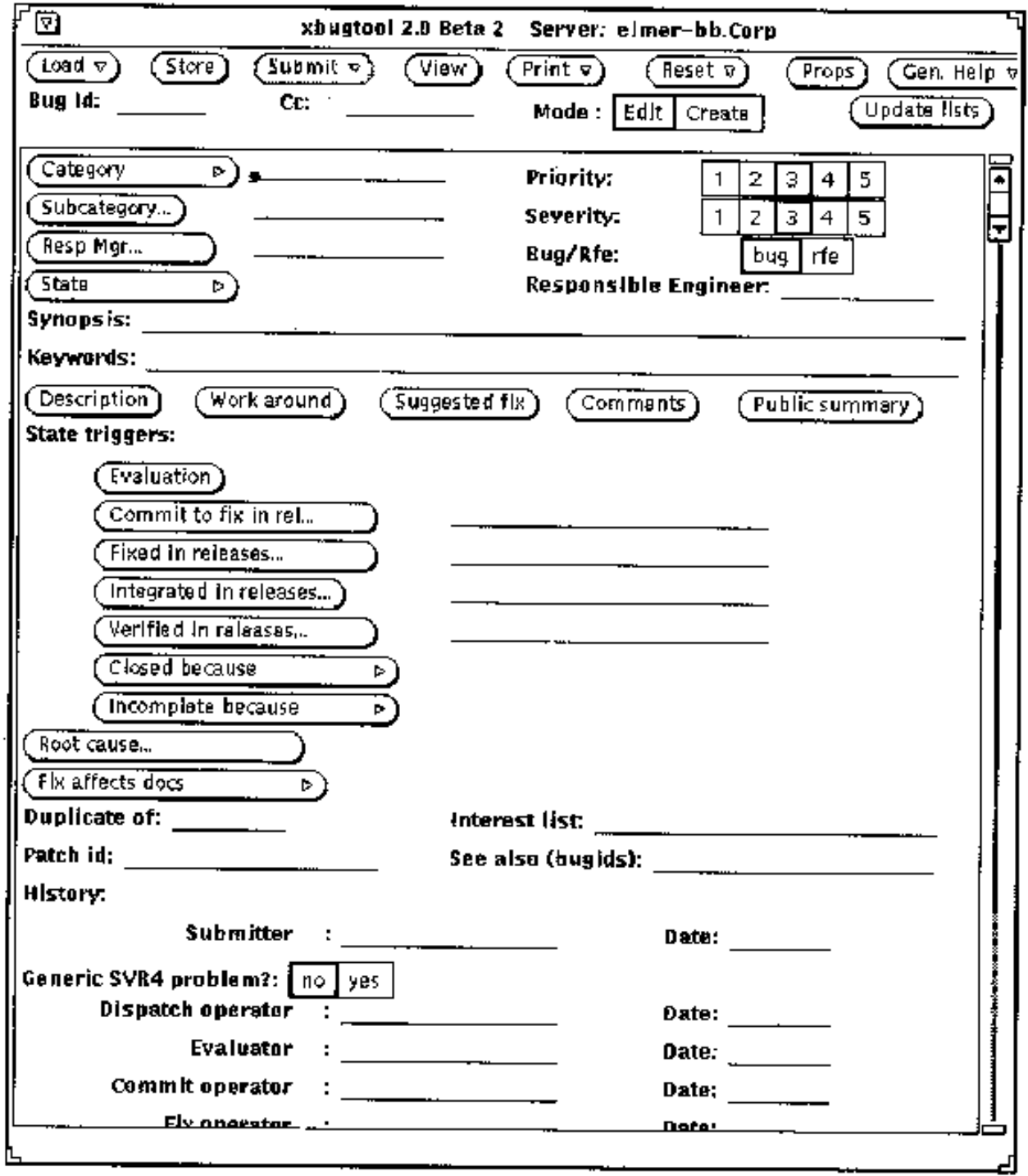
Redesigning a layout using alignment and factoring





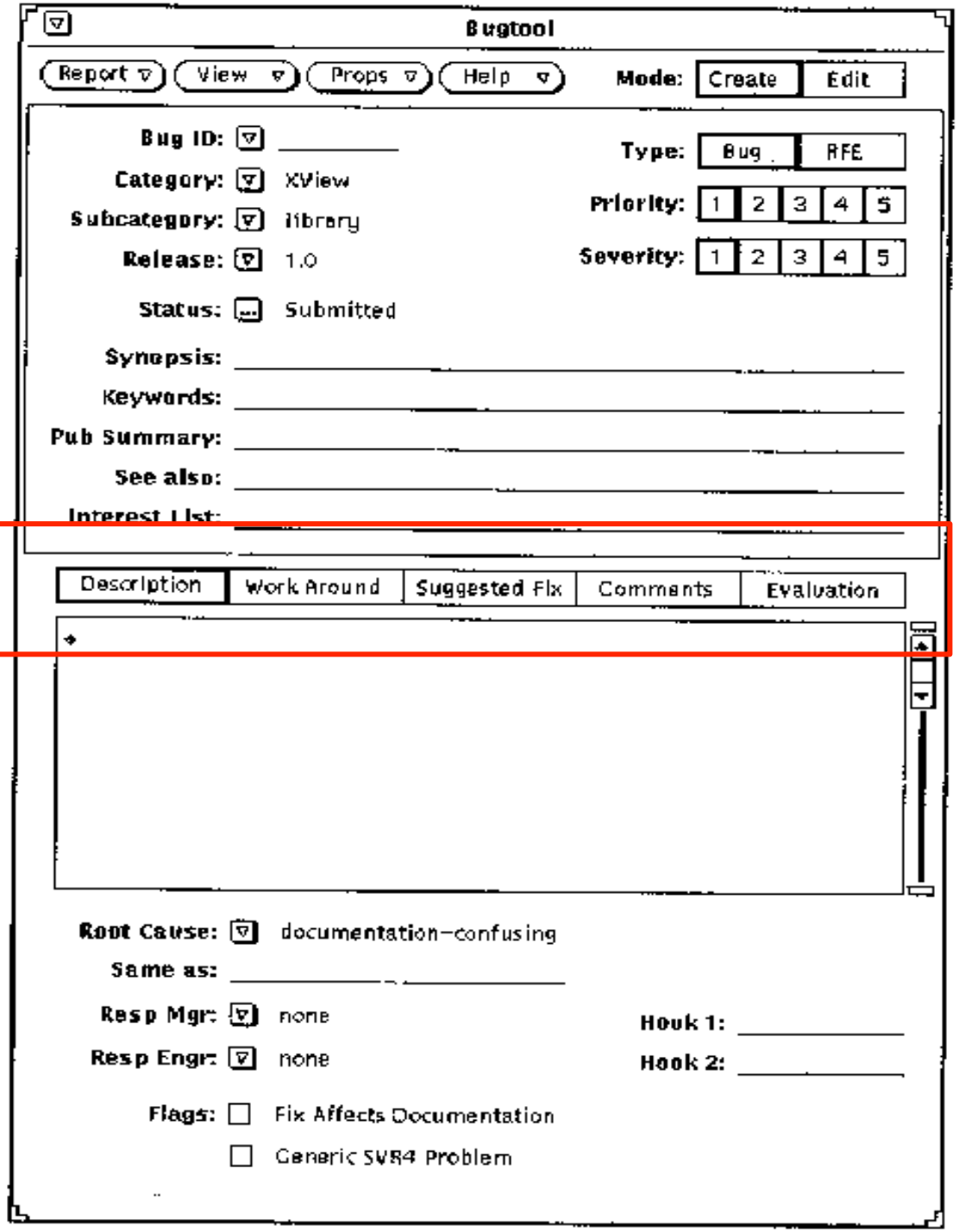
The importance of negative space and alignment

Haphazard layout



Repairing the layout

Factored into tabs



Problem: Easily missed information

- Software developers often assume that if information is displayed users will see it. Not so!
- Common flaw: not focusing user's attention
  - People scan for information, left to right, top to bottom
  - Should design for how human perception works
  - Examples users can miss:
    - Status or mode indicators
    - Prompts for input
    - Results
    - Error or status messages
    - Controls

Examples

- Information too small or not where the user is looking

Client Web application: error message is easy to miss. See it?

Mac login: error message is easy to miss, even though it is displayed in orange.

Examples

- Information buried in noise
- Consider these prompts:
  - Enter filename and press ENTER
  - Enter username and press ENTER
- Only difference is the second word which has the only real information:
  - Filename:
  - Username:

Avoiding missed information

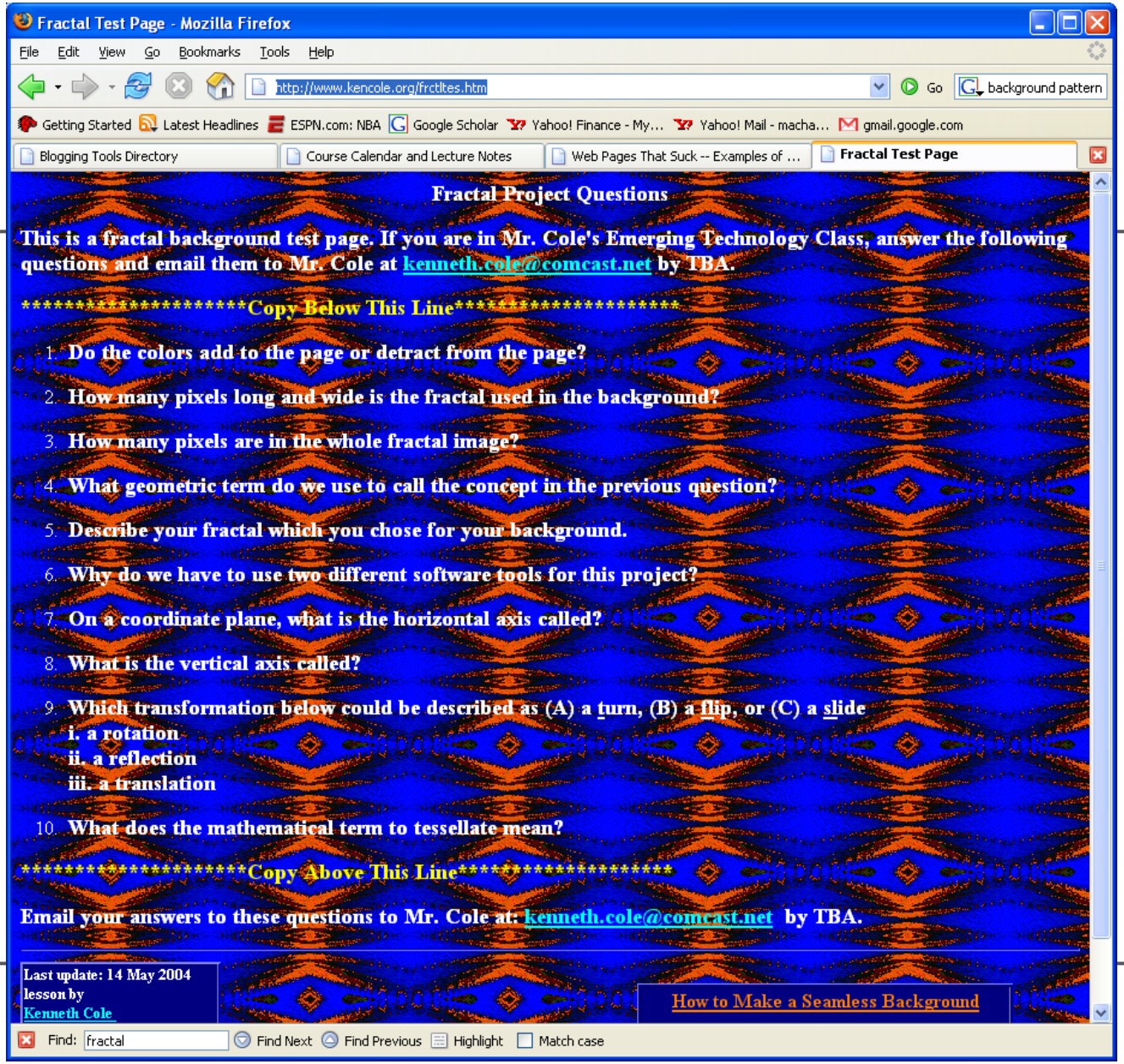
- Construct a visual hierarchy
  - Organize information displays in hierarchical chunks; users ignore irrelevant chunks and find what they want much faster
- Make important information bigger
- Put important information where the user is looking
  - Center of field, not periphery
- Use color to highlight

Uses of Color

- Call attention to specific data or information
- Identify elements of structure and processes
- Portray natural objects realistically
- Depict the logical structure of ideas and processes
- Portray time and progress
- Increase appeal, memorability, and comprehensibility
- Reduce errors of legibility or interpretation
- Increase the number of dimensions for coding data

Pitfalls of Color

- May cause problems for color deficient vision (8-13% of Caucasian males)
- May cause visual fatigue with strong colors
- May contribute to visual confusion if too complex
- May have negative cultural or historical associations
  - E.g., using black in master/slave controller diagram
- May exhibit confusing cross-disciplinary or cultural connotations
  - E.g., Red in Chinese = Warm/Happy, America = Hot/Flashy


Fractal Test Page - Mozilla Firefox
File Edit View Go Bookmarks Tools Help
http://www.kencole.org/frctltes.htm
Go
background pattern
Getting Started
Latest Headlines
ESPN.com: NBA
Google Scholar
Yahoo! Finance - My...
Yahoo! Mail - macha...
gmail.google.com
Blogging Tools Directory
Course Calendar and Lecture Notes
Web Pages That Suck -- Examples of ...
Fractal Test Page
Fractal Project Questions
This is a fractal background test page. If you are in Mr. Cole's Emerging Technology Class, answer the following questions and email them to Mr. Cole at kenneth.cole@comcast.net by TBA.
**********Copy Below This Line**********
1. Do the colors add to the page or detract from the page?
2. How many pixels long and wide is the fractal used in the background?
3. How many pixels are in the whole fractal image?
4. What geometric term do we use to call the concept in the previous question?
5. Describe your fractal which you chose for your background.
6. Why do we have to use two different software tools for this project?
7. On a coordinate plane, what is the horizontal axis called?
8. What is the vertical axis called?
9. Which transformation below could be described as (A) a turn, (B) a flip, or (C) a slide
i. a rotation
ii. a reflection
iii. a translation
10. What does the mathematical term to tessellate mean?
**********Copy Above This Line**********
Email your answers to these questions to Mr. Cole at: kenneth.cole@comcast.net by TBA.
Last update: 14 May 2004
lesson by
Kenneth Cole
How to Make a Seamless Background
Find: fractal
Find Next
Find Previous
Highlight
Match case

Tradewars 2002 - Mozilla Firefox
File Edit View Go Bookmarks Tools Help
http://www2.cajun.net/~hugh/tradewar.html
Go
background pattern
Getting Started
Latest Headlines
ESPN.com: NBA
Google Scholar
Yahoo! Finance - My...
Yahoo! Mail - macha...
gmail.google.com
Blogging Tools Directory
Course Calendar and ...
Web Pages That Suck ...
Free Backgrounds
Fractal DZine Graphics
Tradewars 2002
Changes in Bust Clearing
PART ONE: History of The Game
Tradewars, it's a Life, not a Game. At least that's how a lot of people see it, just ask any addict!
Tradewars was invented in the early 1980's by Chris Sherrick. Back then, the game was a very simple affair, one type of ship, no planets, etc. Approximately 10 years ago, Chris sold his software source code to several individuals, one of whom was Glen Fredericks of Clifton, NJ. Glen developed the game for several years, and invented the random universe creation. I first learned the game on Glen's BBS, having a lot of fun working with him (back in the mid 80's) on beta testing of early versions. Various authors took the game in different directions, but most of them were eventually abandoned.
About 1990, the dominant author became Gary Martin. This is the version that has survived to this day. Gary added most of the features that are present in the current game including the Ferrengi, all the different ship types, planets, and the wonderful graphics that make the game so nice.
Today, Gary's product is available in 2 forms. There is the multi- player game for Major BBS (MBBS) and the DOS version used by other BBS types such as PCBoard that run it as a "door", generally as a single player game. The DOS version can be run at home without a BBS. Most features are identical in both games, though minor differences do exist. Most of the development work is done on the MBBS Version, the DOS version is lagging behind.
The MBBS Version has much greater flexibility for sysop configuration and has all the latest tricks lacking in the DOS Version.
The DOS version is available as shareware and the MBBS version is obtainable only from the author at costs starting at $ 700.- or so. (sigh)
PART TWO - BEGINNER'S BASICS
Find: fractal
Find Next
Find Previous
Highlight
Match case

Suggested Color Selections

- Screen background: subdued, receding color such as grayish blue.
- Window background: a dark color or off-white.

Suggested Color Selections (continued)

- Icons and menus:
  - Nonselectable items – eliminate or minimal contrast with background.
  - Selectable items – contrast with background.
  - Selected items – reverse video, contrasting color, or outline box as the cursor passes over them.
  - Activated items – change from an outline box to reverse video or a color bar.

Suggested Color Selections (continued)

- Menus and dialogue areas: backgrounds should be subdued white, black, or dark blue to provide adequate contrast.

- Scroll bars: a solid or outline color which keeps them from being too visually dominant.

Suggested Color Selections (continued)

- Titles and key window information:
  - **off-white inside a black or dark-colored band or**
  - **an inset in black, a dark color, or a contrasting color inside a colored or textured band.**

Suggested Color Selections (continued)

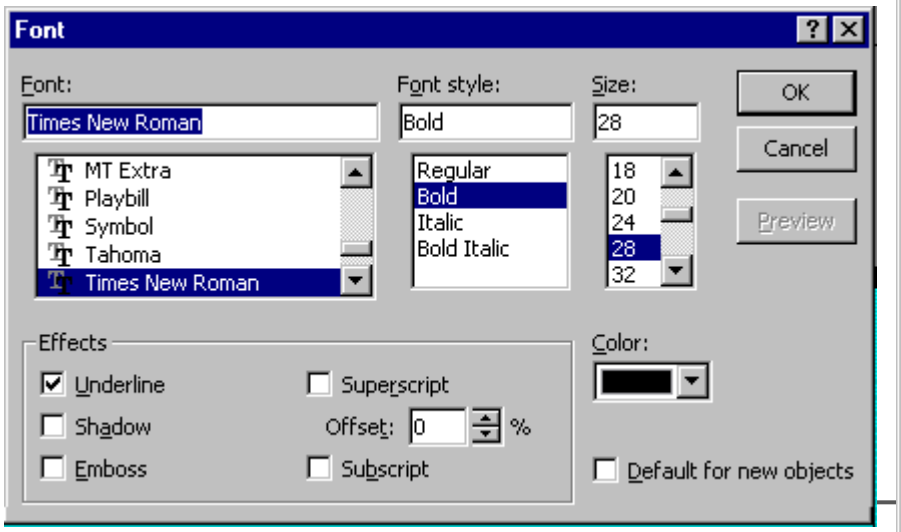
- Alert areas:
  - A red border or graphic indicator
  - If small, near the center of the screen
- Issues?

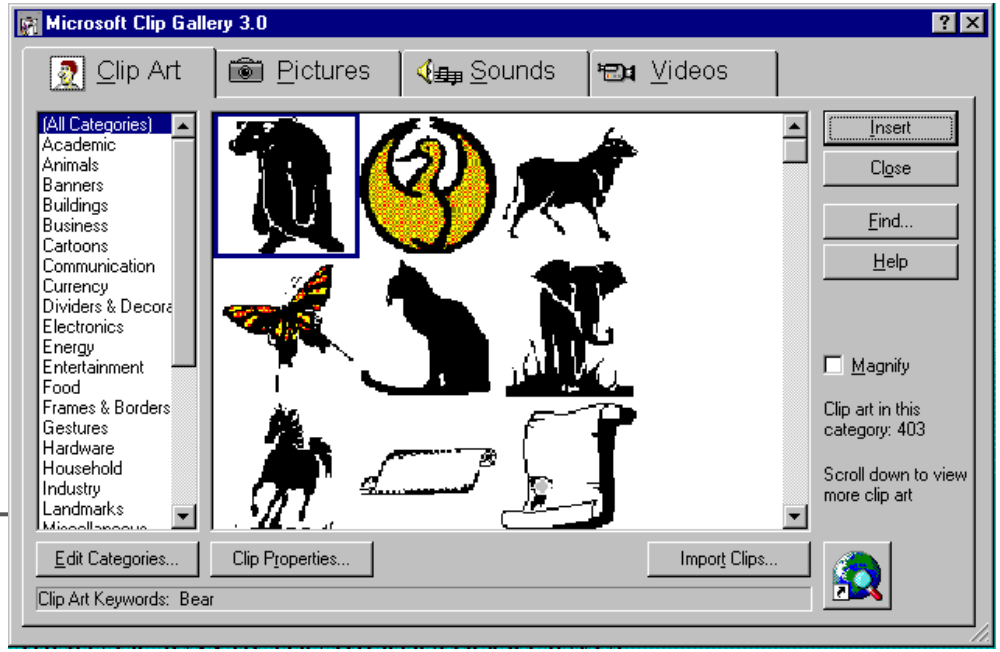
Minimize user's memory load

Promote recognition over recall

- menus, icons, choice dialog boxes vs commands, field formats
- relies on visibility of objects to the user

(but less is more!)





From Microsoft applications

Economy of visual elements

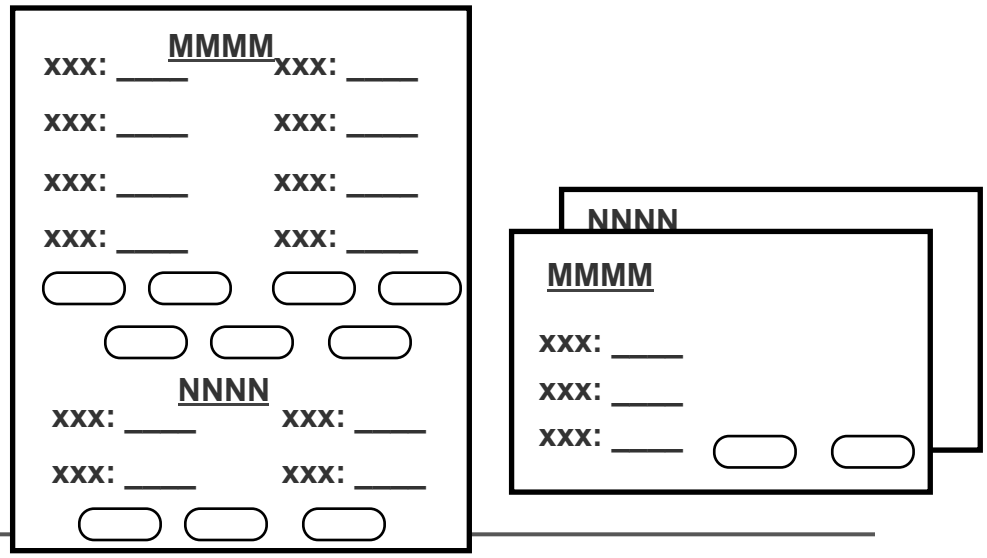
minimize number of controls

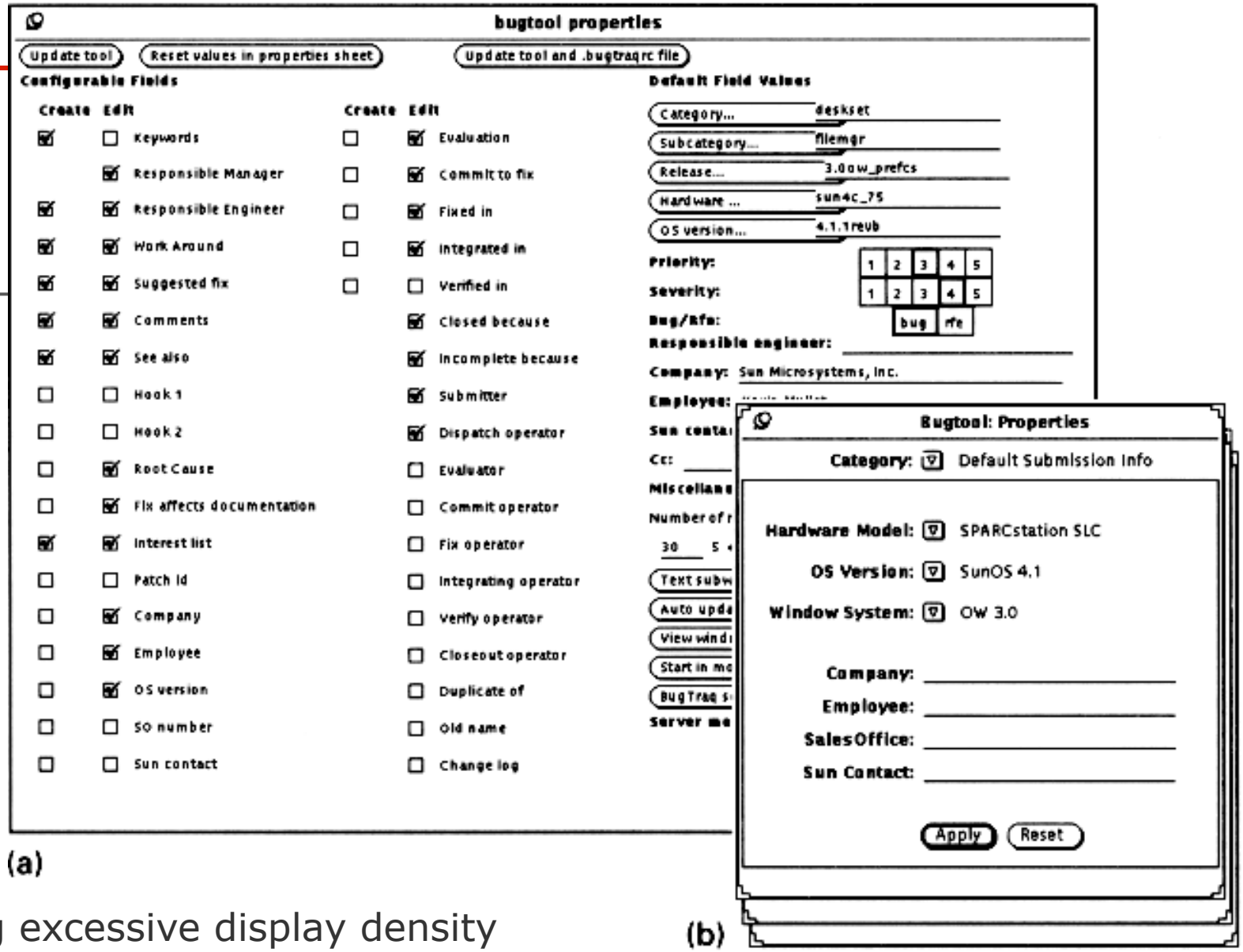
include only those that are necessary

eliminate, or relegate others to secondary windows

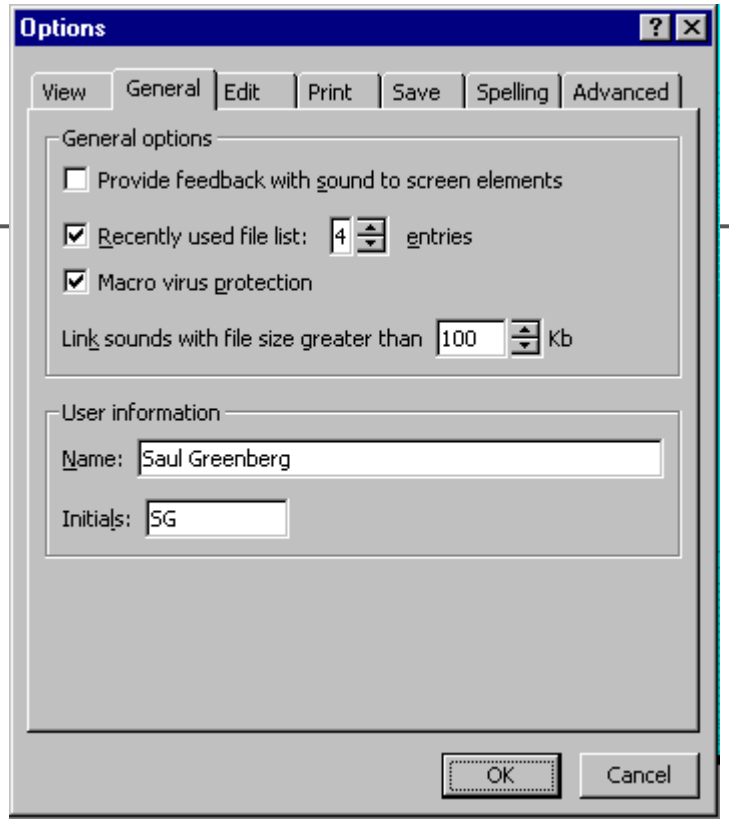
minimize clutter

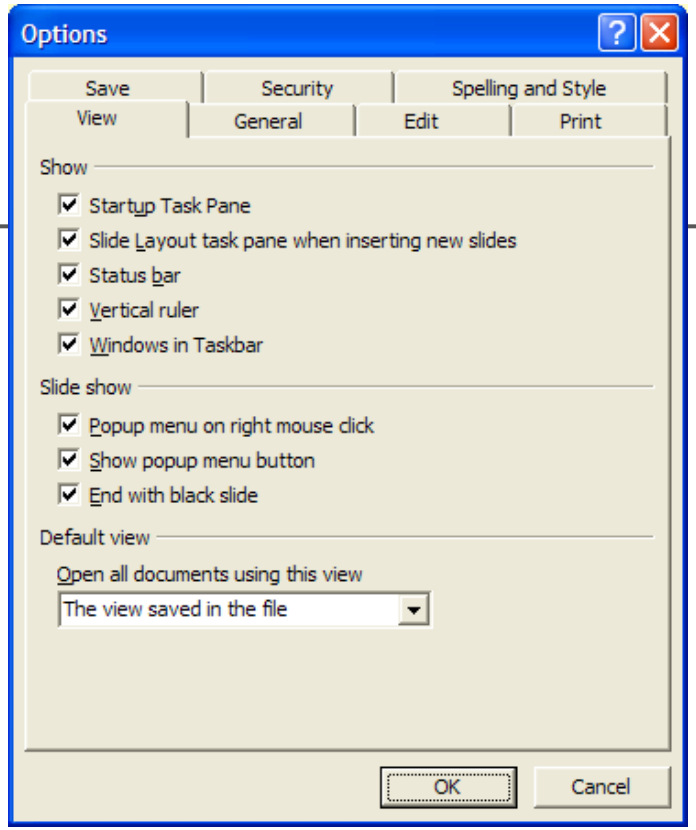
so information is not hidden





Repairing excessive display density





Tabs

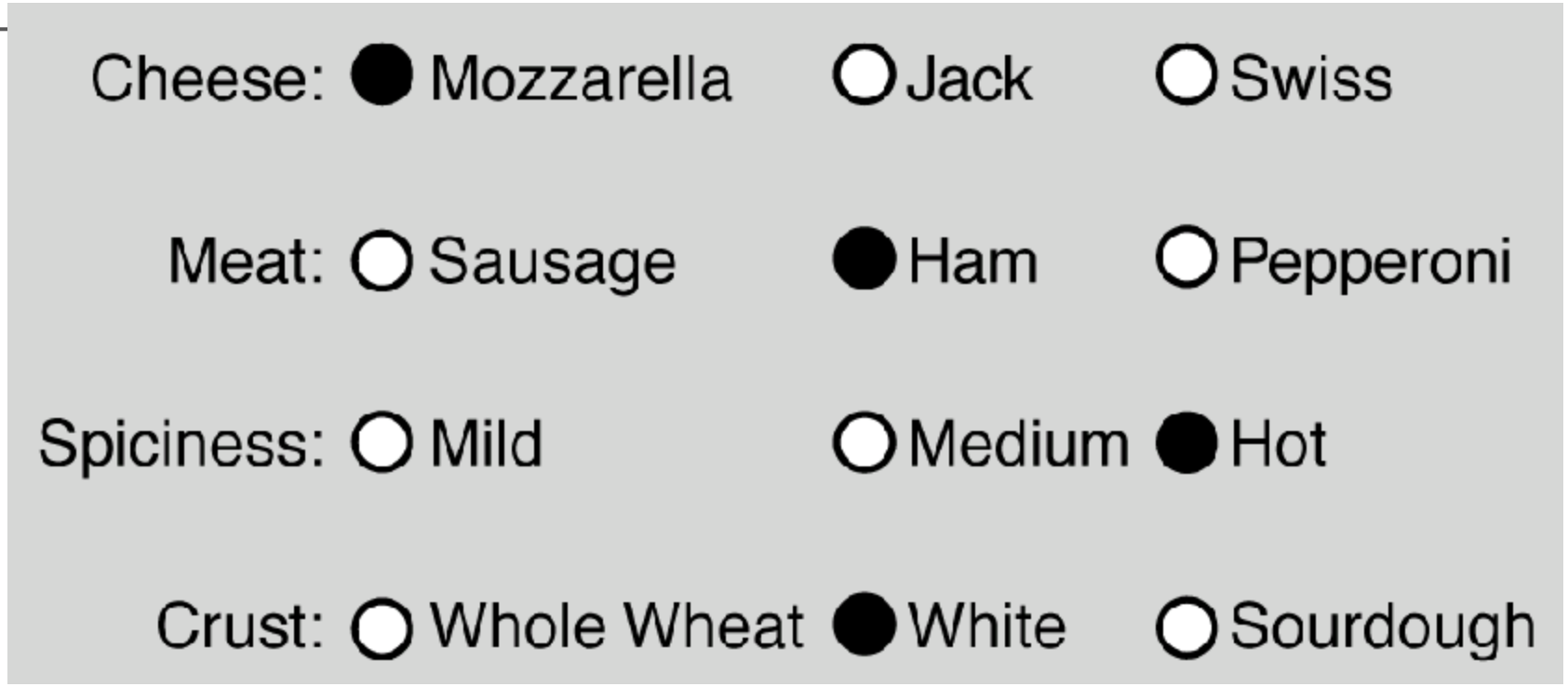
excellent means for factoring related items

but can be overdone

Problem: control spacing

- Example:
- Related radio buttons should be grouped closely together

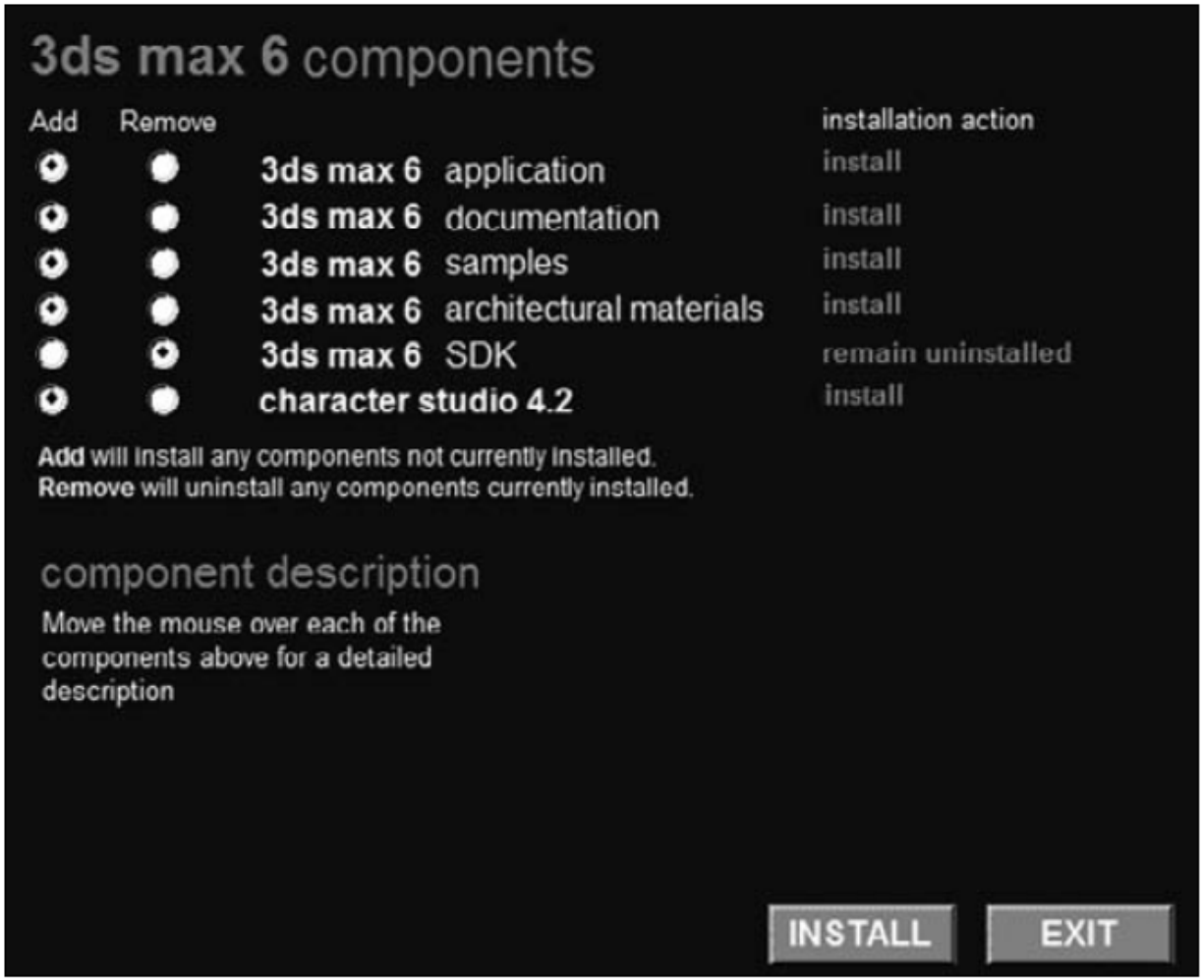
Improved Spacing



Poor spacing: Examples

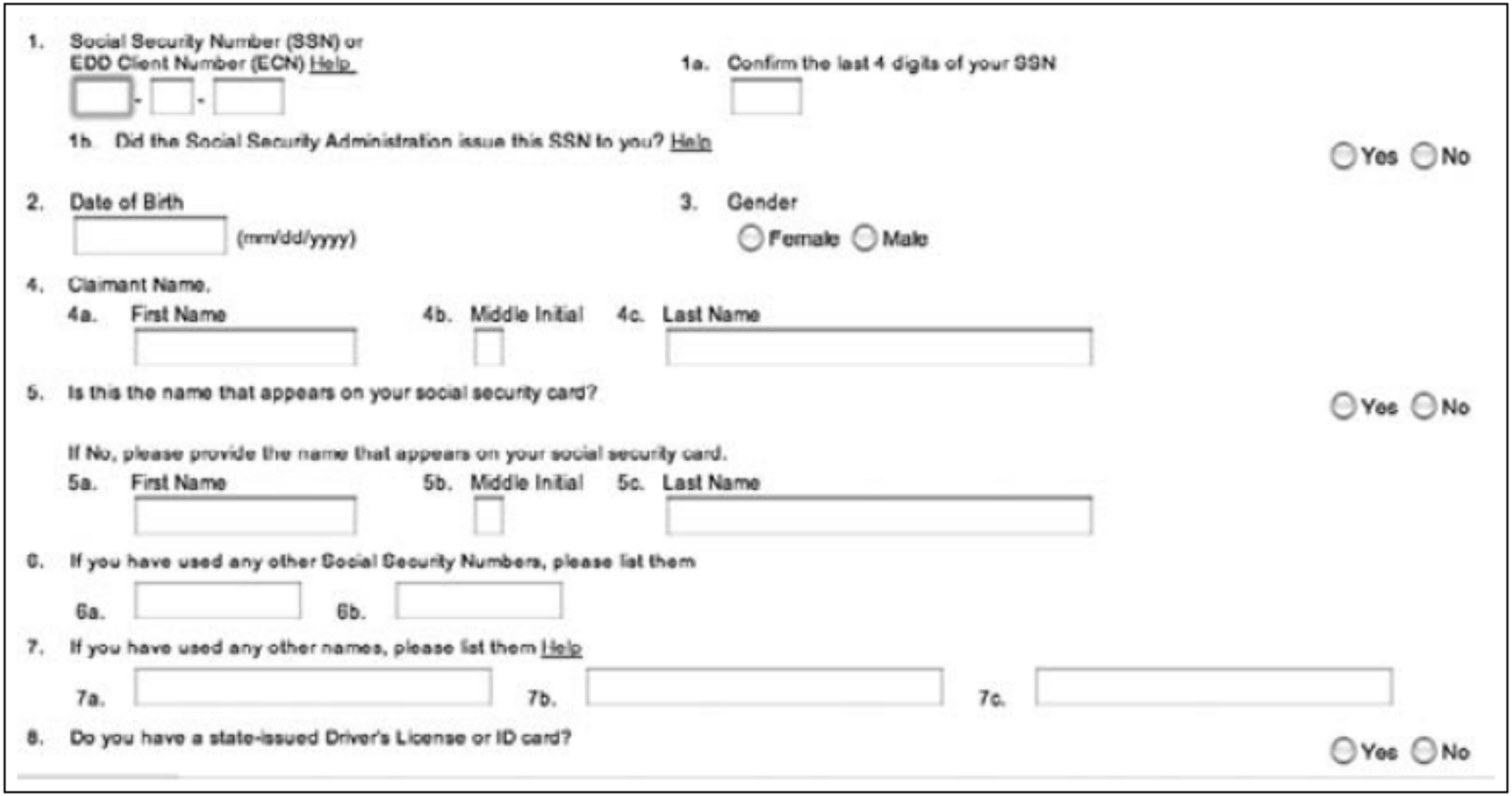
IEEE.org: radio buttons spaced too far apart to be seen as related.

Poor spacing: Examples



Your name:
E-mail address:
Zipcode (if applicable):
How you heard of us:
-- Choose --
Username:
Password:
Re-type your password:
Password hint (this will be sent to you if you forget your password):
Would you like to receive the quarterly IOBABooks.com newsletter?
Already have a IOBABooks.com account?
Create Account!

Stranded Labels: Example



1. Social Security Number (SSN) or EDD Client Number (ECN) Help
   ___ - ___ - ___
   1a. Confirm the last 4 digits of your SSN ___

   1b. Did the Social Security Administration issue this SSN to you? Help ◯ Yes ◯ No

2. Date of Birth ___ (mm/dd/yyyy)

3. Gender ◯ Female ◯ Male

4. Claimant Name.
   4a. First Name ___ 4b. Middle Initial ___ 4c. Last Name ___

5. Is this the name that appears on your social security card? ◯ Yes ◯ No

   If No, please provide the name that appears on your social security card.
   5a. First Name ___ 5b. Middle Initial ___ 5c. Last Name ___

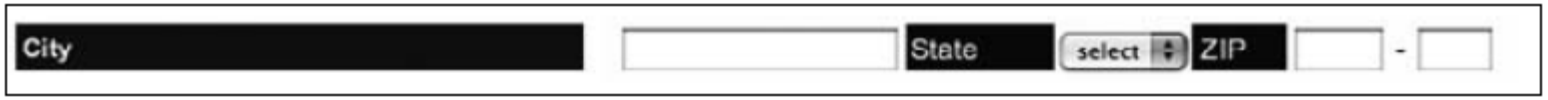
6. If you have used any other Social Security Numbers, please list them
   6a. ___ 6b. ___

7. If you have used any other names, please list them Help
   7a. ___ 7b. ___ 7c. ___

8. Do you have a state-issued Driver's License or ID card? ◯ Yes ◯ No

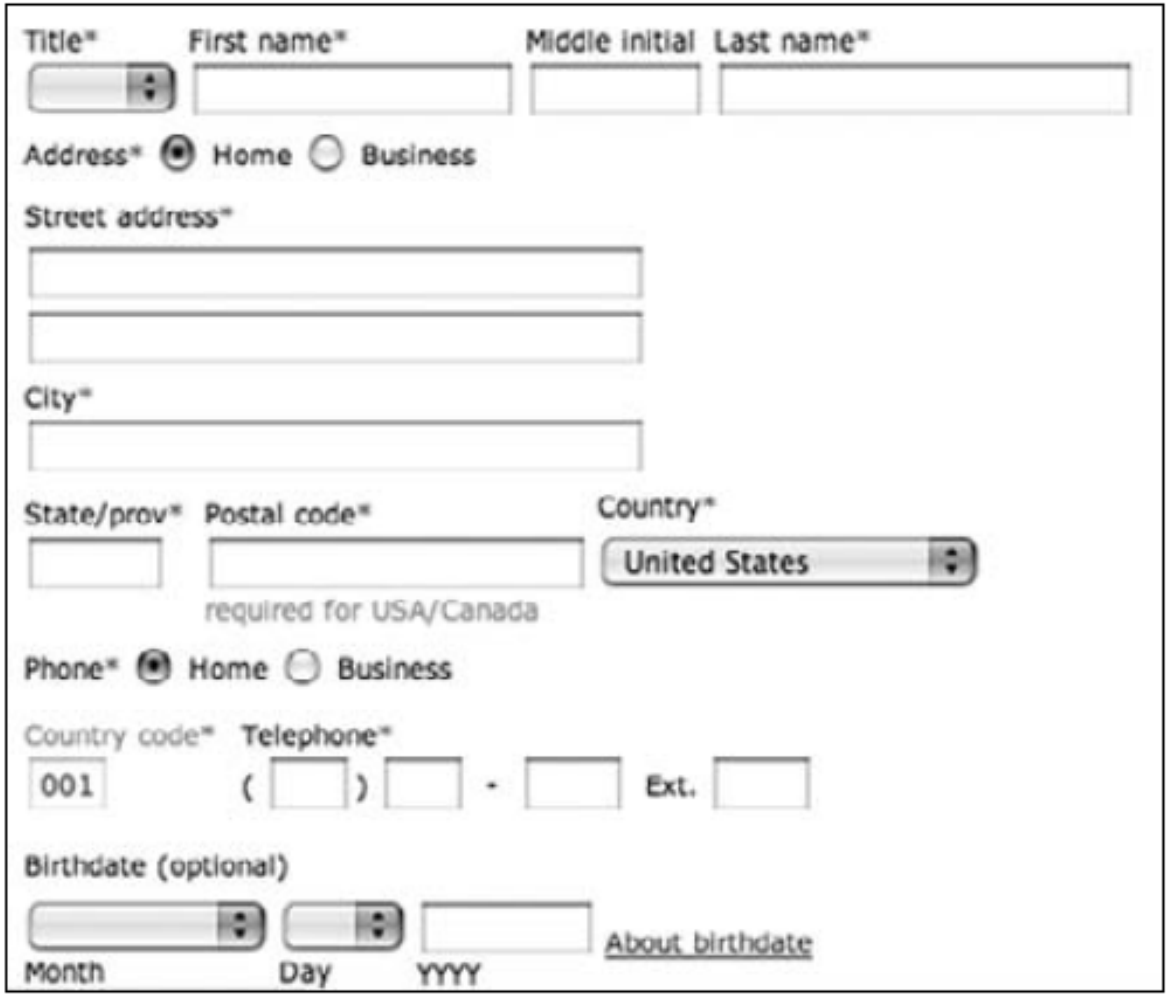
CA.gov unemployment insurance form: "Yes"/"No" radio buttons are too far from their labels.

City
State
select
ZIP
-


City
State
select
ZIP
-

Solutions

- Don’t attach labels and data fields to opposite edges of a form or control panel
- Don’t allow a few long labels to dictate the alignment of the entire form
- Labels should be closer to their own field than to other fields
- Put labels above fields



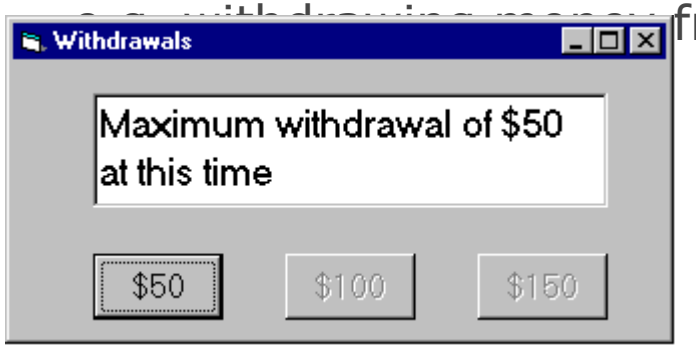
United.com: labels above fields.

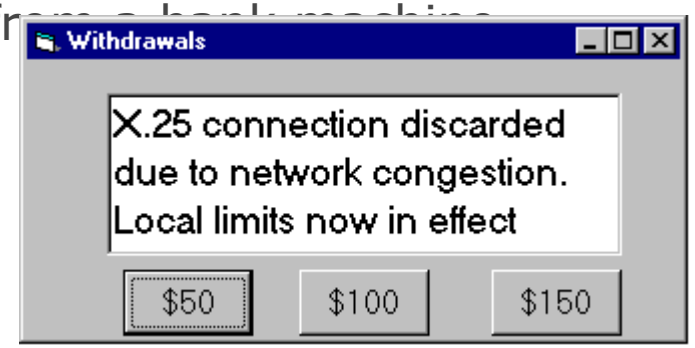
Problem: Inconsistent Label Alignment

- Labels should be consistent in where they are placed throughout the application
- Extreme case:

Speak the users' language

Terminology based on users' language for task



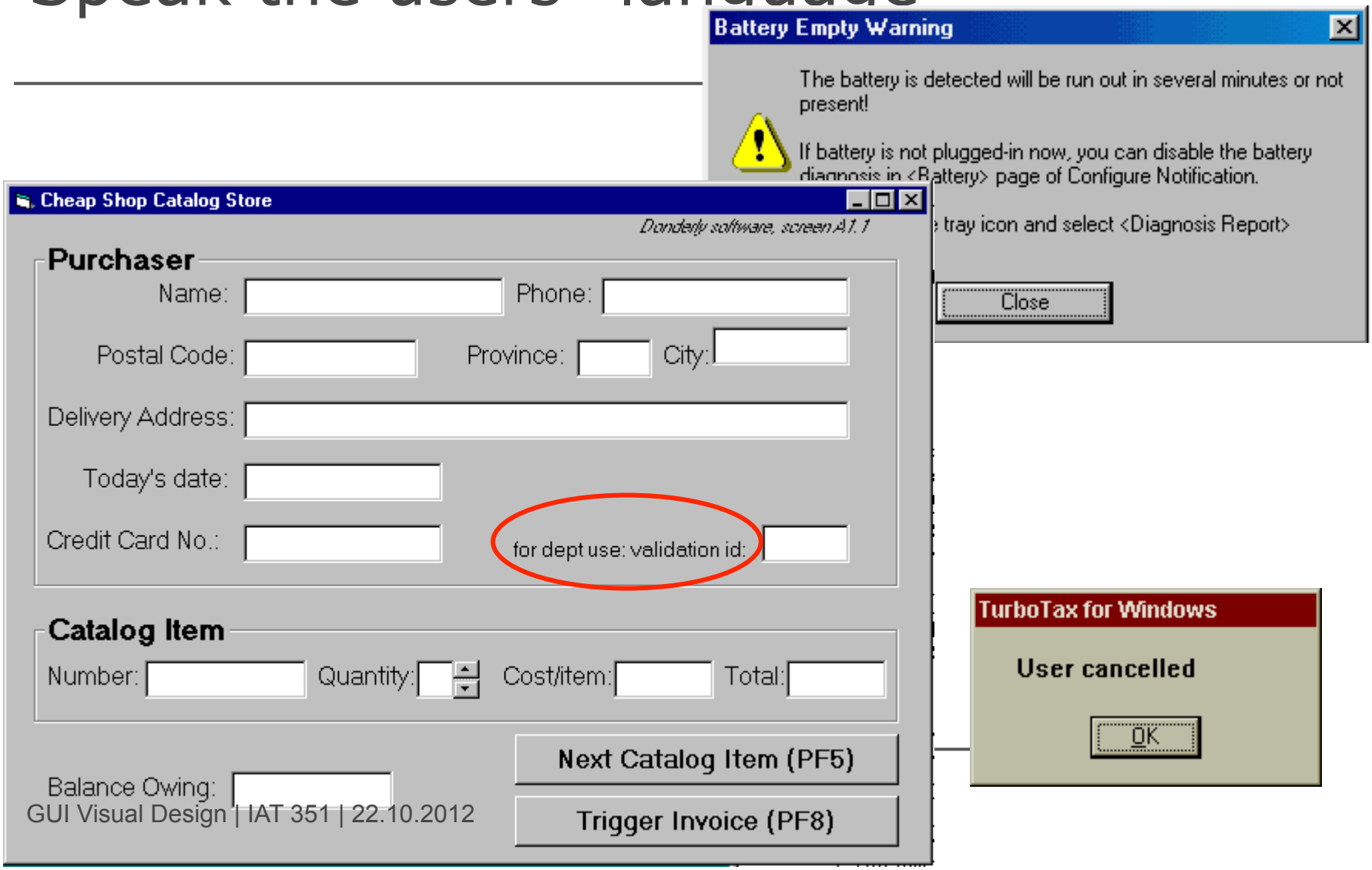


Use meaningful mnemonics, icons & abbreviations

- eg File / Save
  - Ctrl + S (abbreviation)
  - Alt FS (mnemonic for menu action)
  -

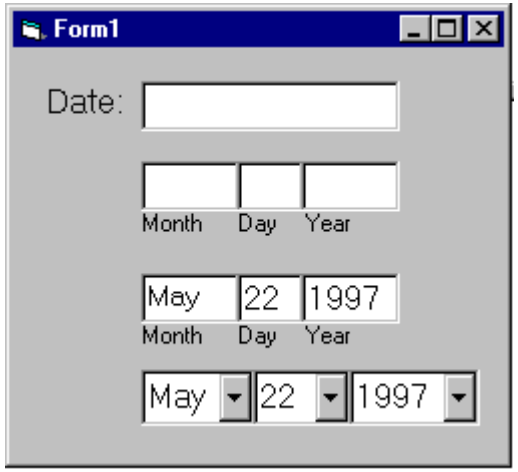
(tooltip icon)

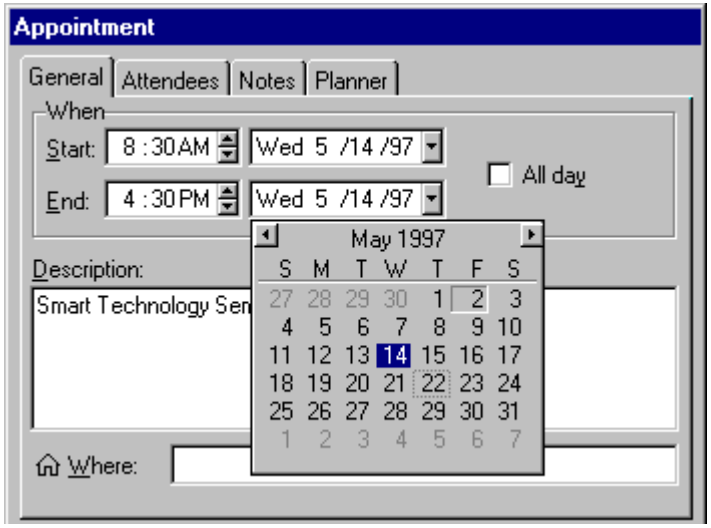
Speak the users' language



Minimize user's memory load

Give input format, example and default

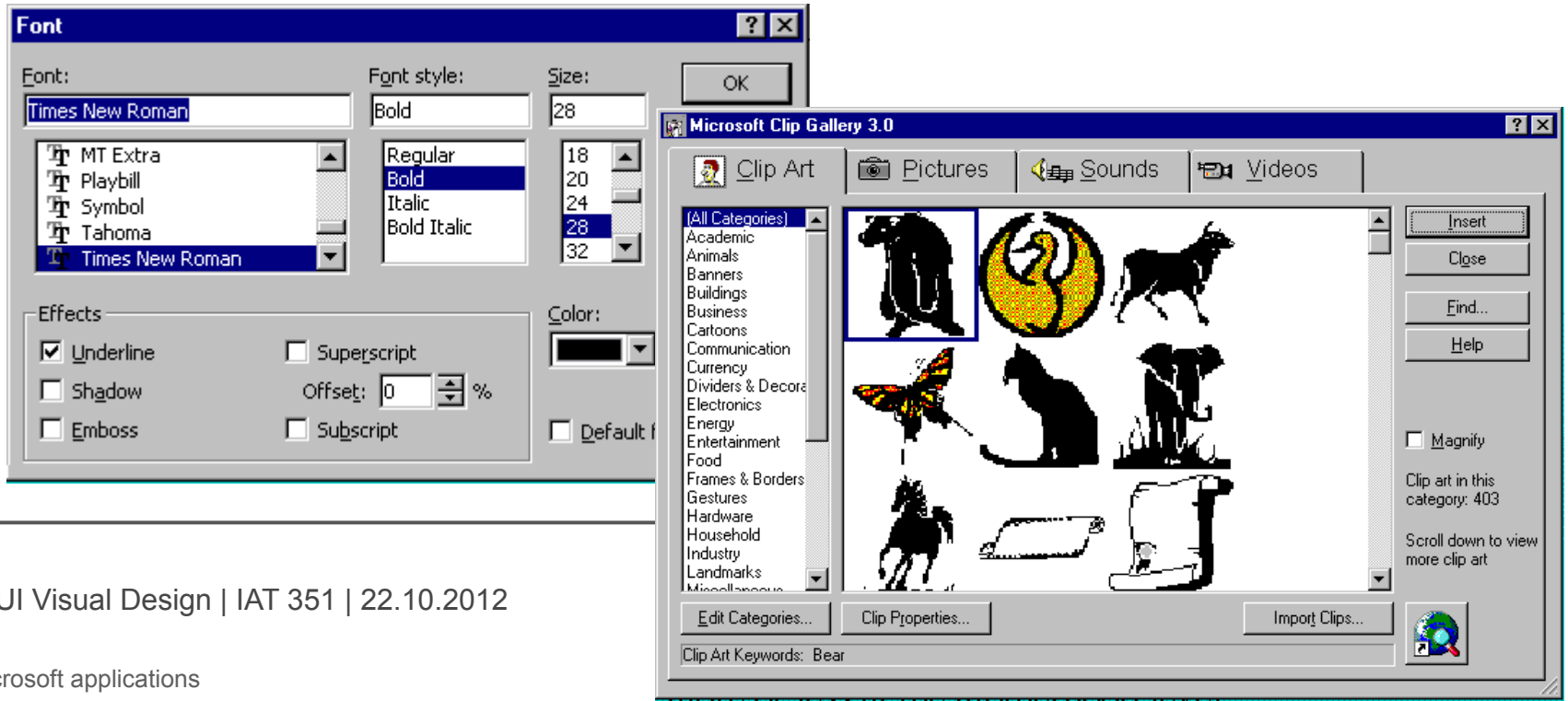




Minimize user's memory load

Promote recognition over recall

- menus, icons, choice dialog boxes vs commands, field formats
- relies on visibility of objects to the user (but less is more!)

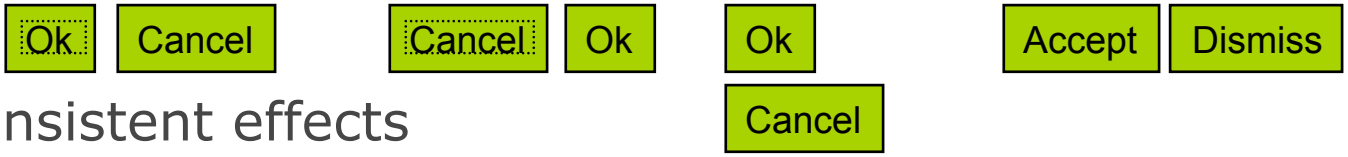


From Microsoft applications

Be consistent

Consistent syntax of input
Consistent language and graphics

- same visual appearance across the system (e.g. widgets)
- same information/controls in same location on all windows



Consistent effects

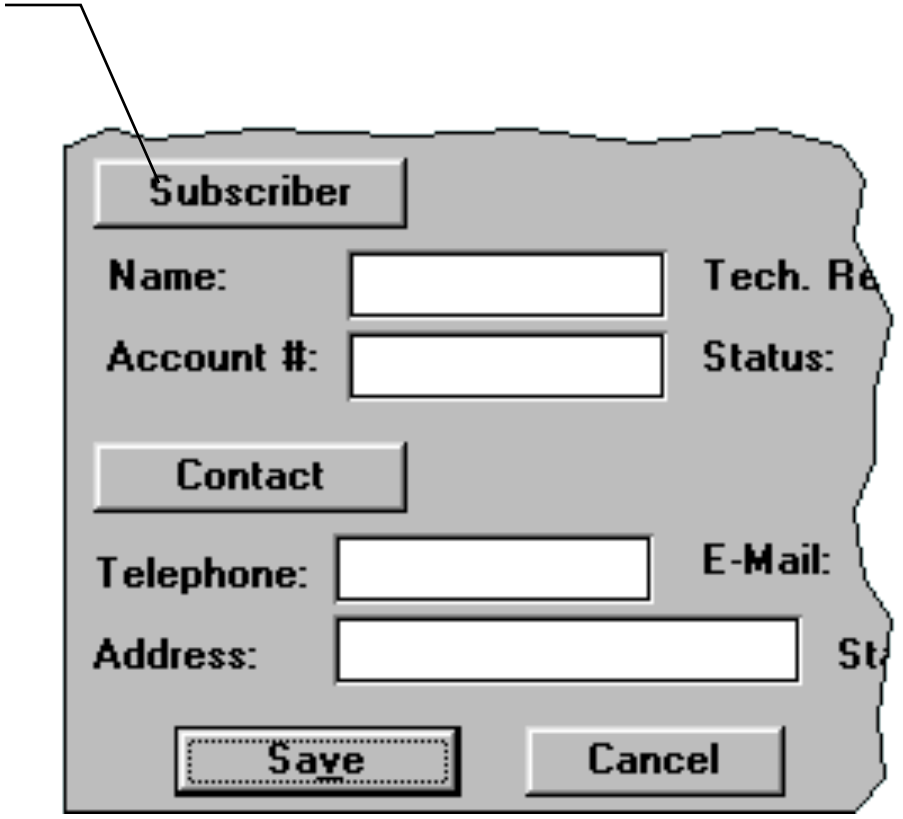
- commands, actions have same effect in equivalent situations
- Predictability

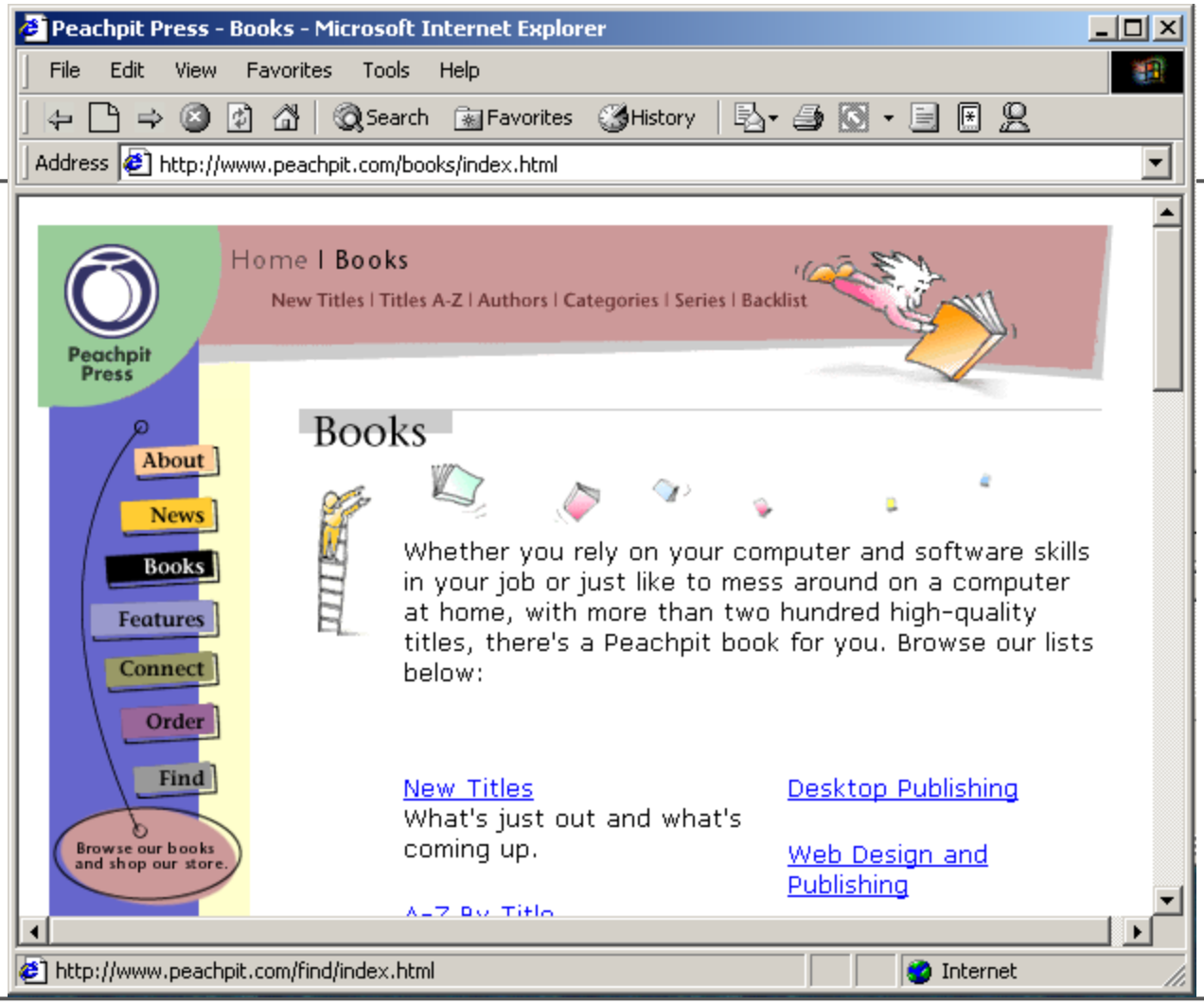
Terrible real-world examples??

Be Consistent

These are labels with a raised appearance.

Is it any surprise that people try and click on them?

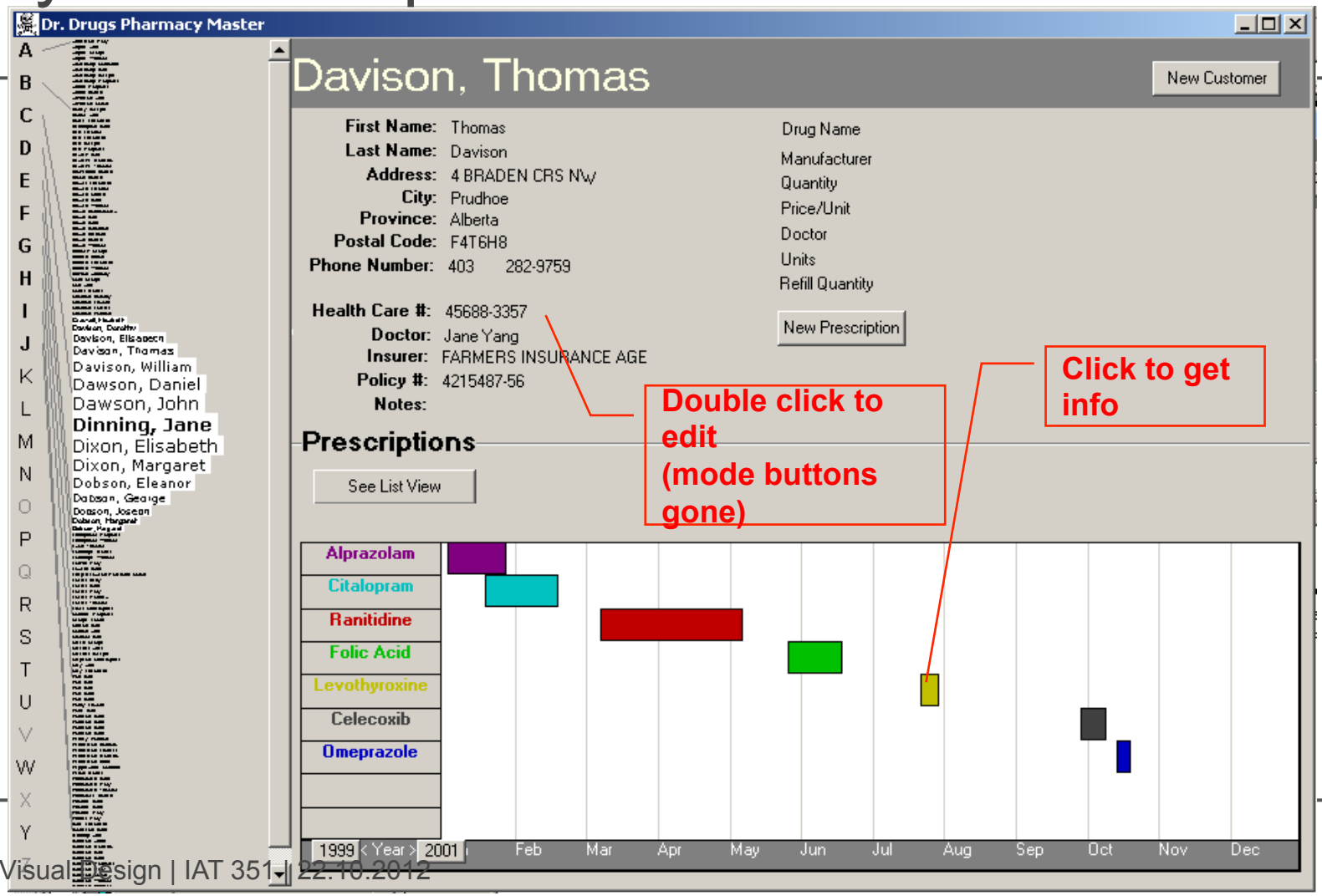




From Peachpit website

From Peachpit website

Anyone see a problem here?



By Saul Greenberg's CS 481 students Brant LeClercq, Lloyd Yoon, Amy Yang (with permission)

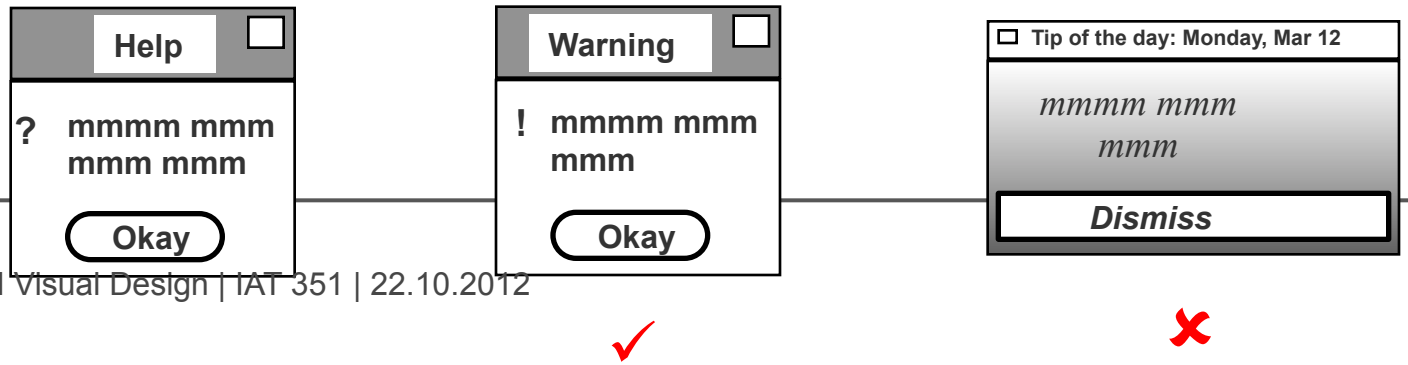
Visual consistency (repetition)

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

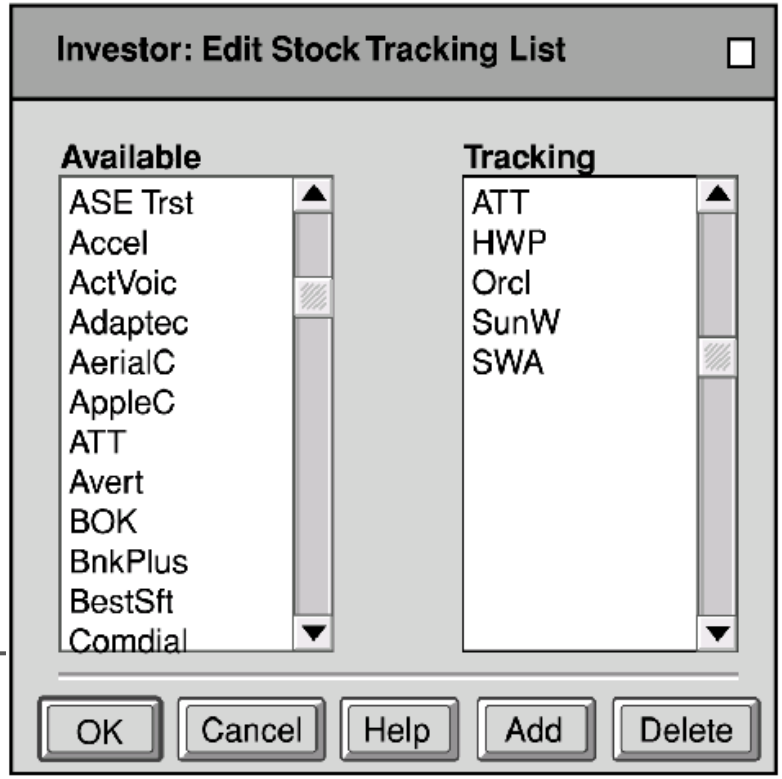
World consistency
- follow common symbols and conventions

deviate only when it provides a clear benefit to user



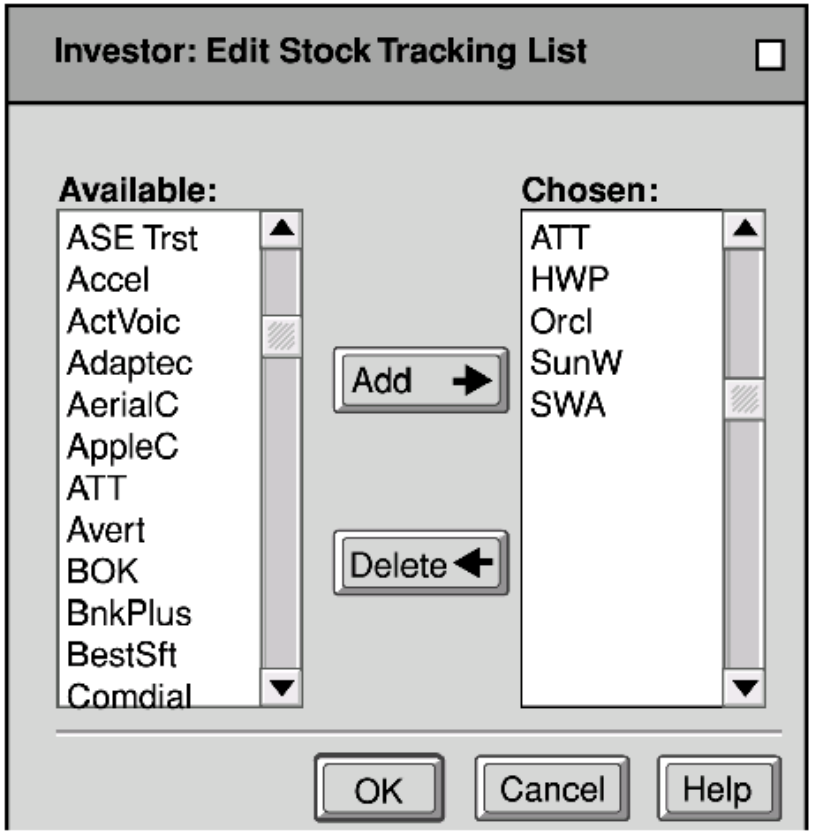
Problem: inappropriate consistency

- This happens when you add new buttons to the standard “OK”, “Apply”, “Close”, “Cancel” buttons
- Everything OK here?



Align Buttons To Controls

- It can be hard to see the connection between the new buttons and data
- Make functions clear by separating content control buttons from window control buttons



Legibility and readability

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

Text set in Helvetica

TEXT SET IN CAPITALS

Text set in Braggadocio

Text set in Times Roman

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

Large
Medium
Small

Readable

Design components to be inviting and attractive

Design components to be inviting and attractive

✓

Unreadable

Design components to be *inviting* and attractive

Design components to be **inviting** and ***attractive***

✗

Legibility and readability

typesetting

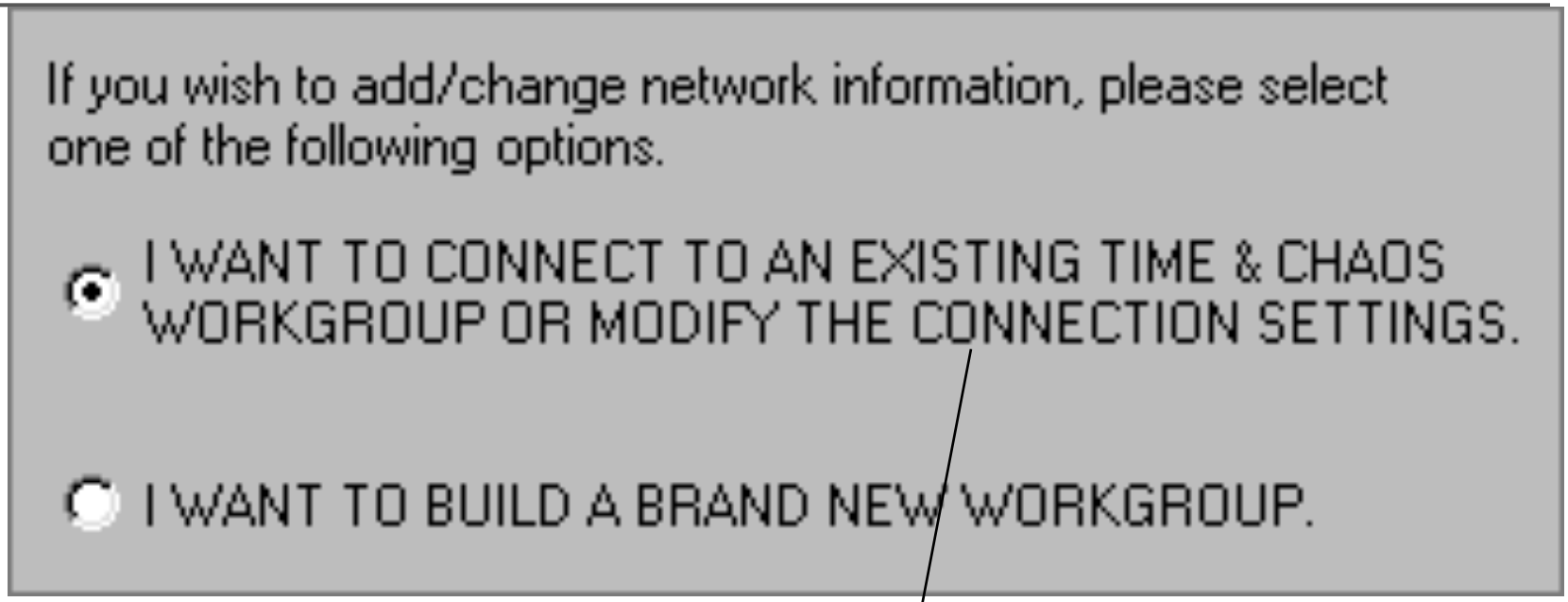
- point size
- word and line spacing
- line length
- Indentation
- color

Readable

Design components to be inviting and attractive

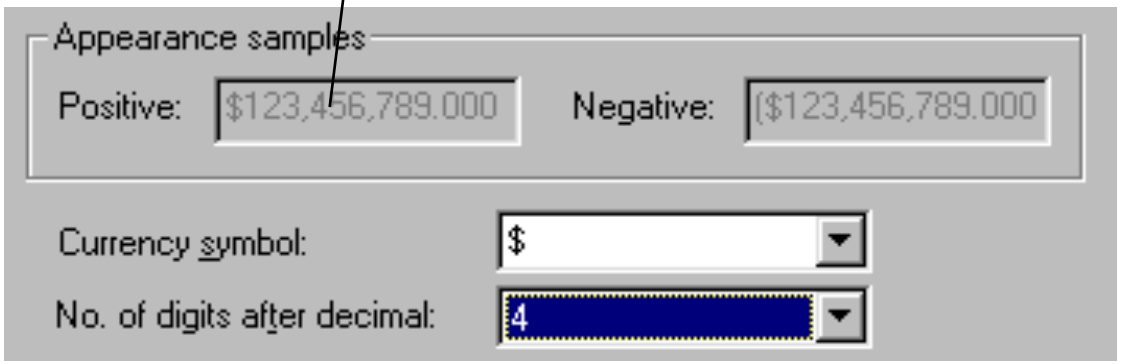
Design components to be inviting and attractive

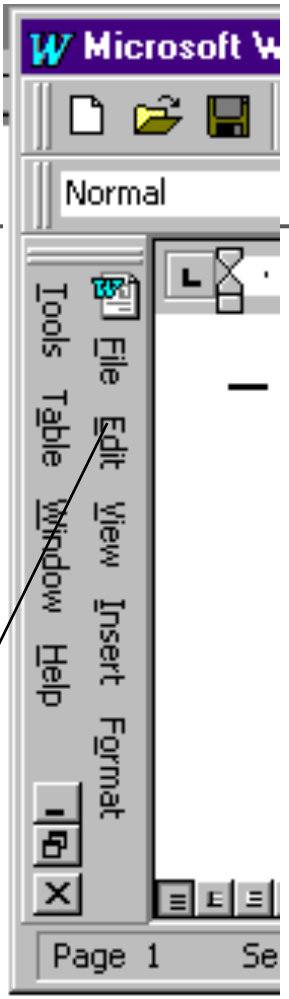
Unreadable: Design components to be easy to interpret and understand. Design components to be inviting and attractive



These choices must be really important, or are they?

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





Text orientation difficult to read

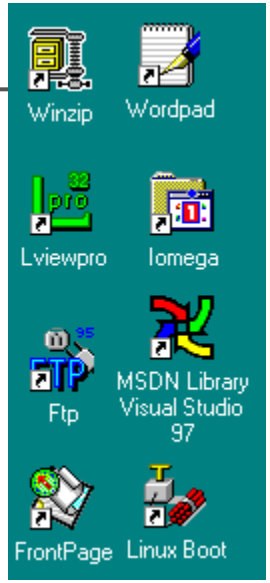
Imagery

Signs, icons, symbols
- right choice within spectrum from concrete to abstract

Icon design *very* hard
- except for most familiar, always label them

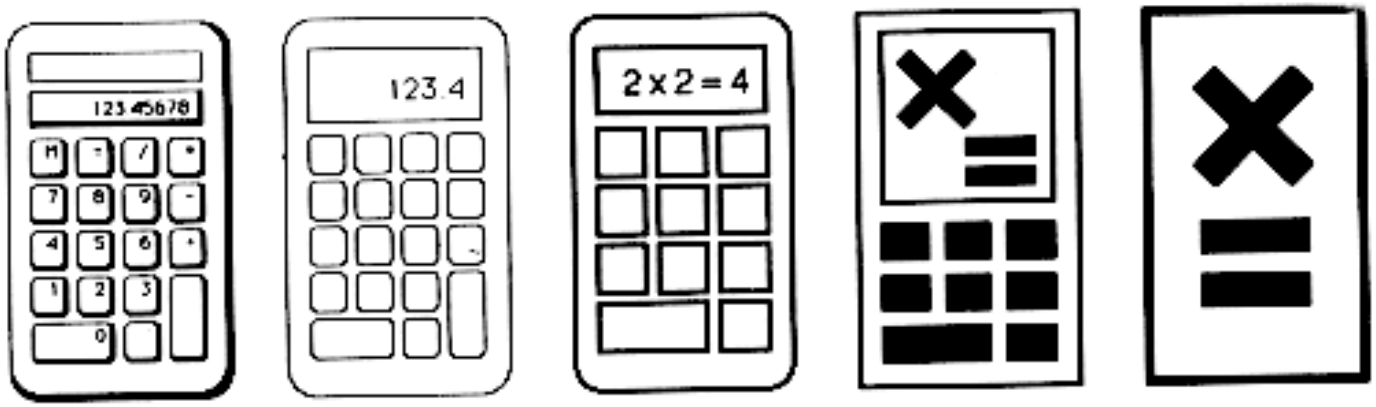
Image position and type should be related
- image “family”

Consistent and relevant image use
- identifies situations, offerings...

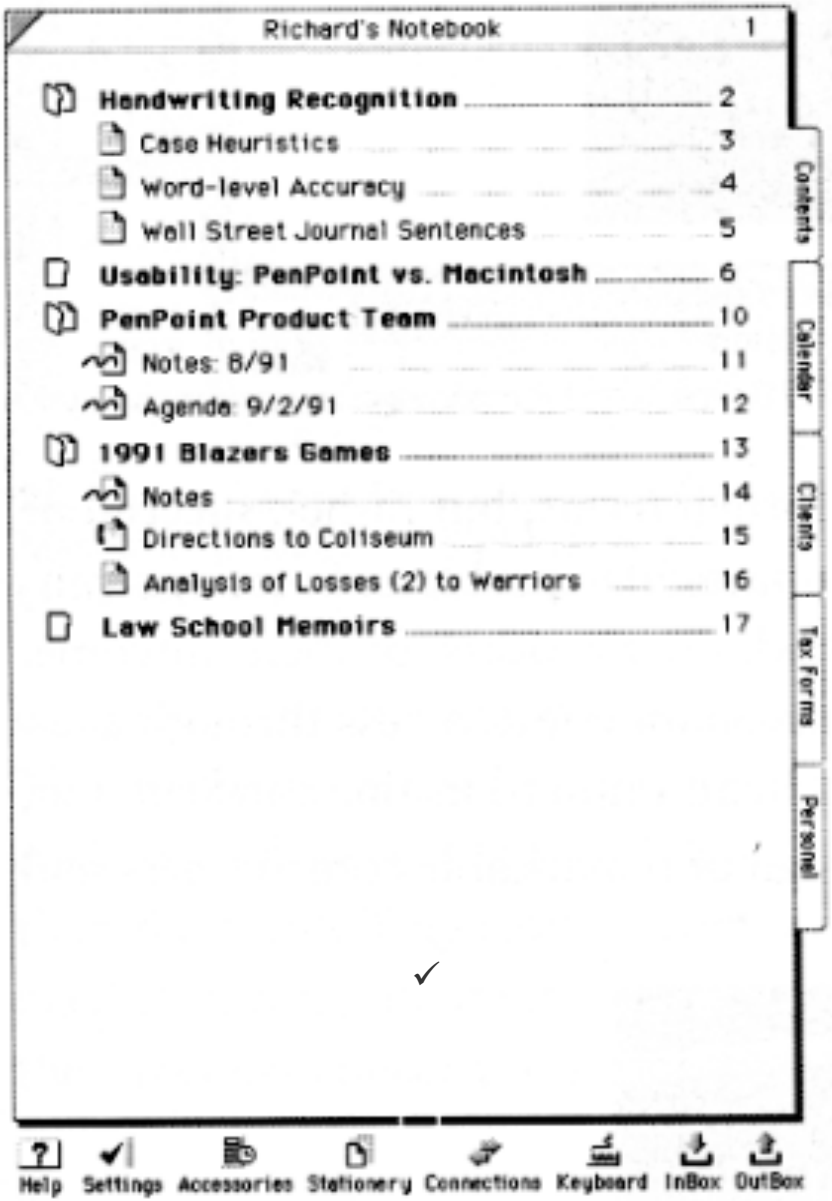


Partial icon family

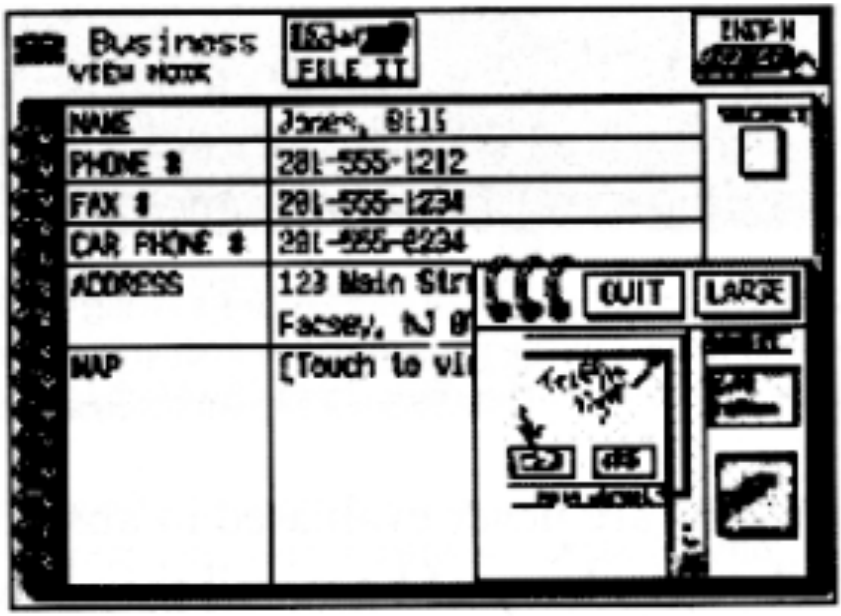
Choosing levels of abstraction



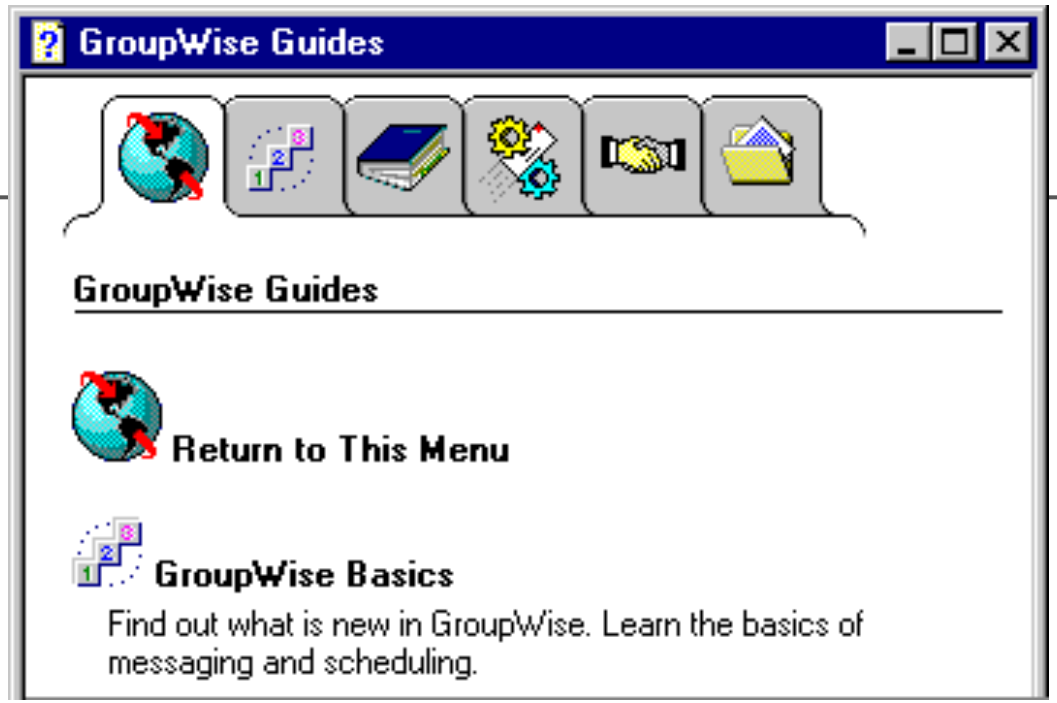
Refined vs excessive literal metaphors



✓



×



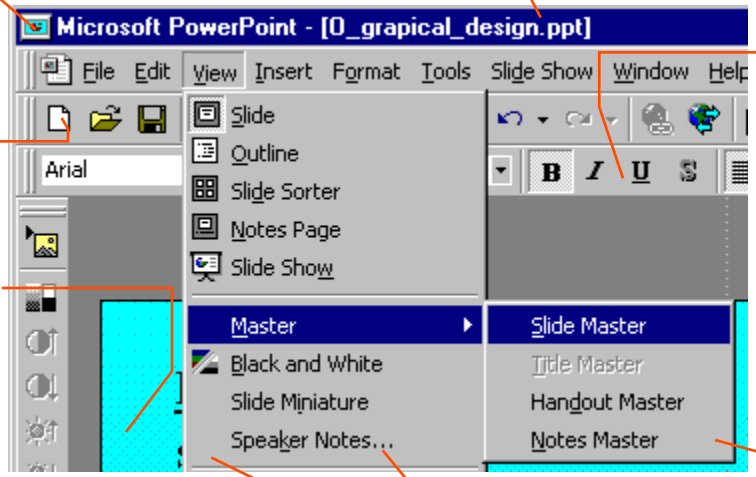
What do these images mean?

- 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

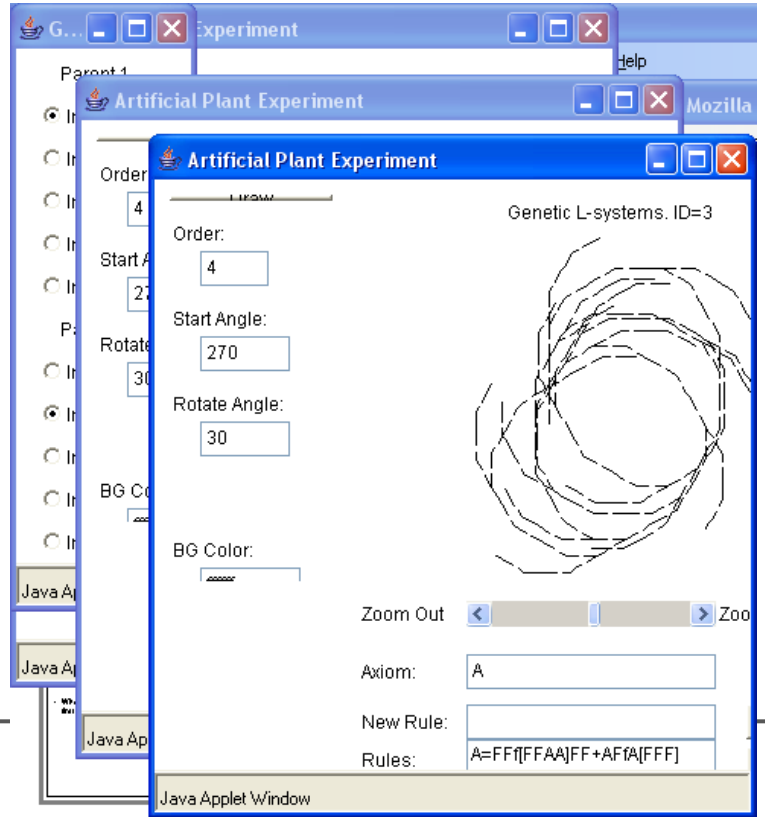


Microsoft Powerpoint

Problem: Poor Window Location

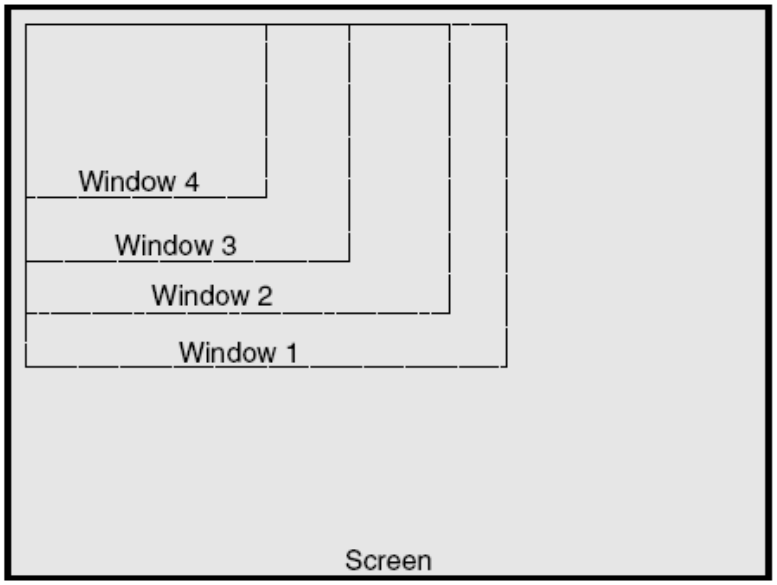
- Where should an application's windows first appear?

- Heuristics:
  - On-screen
  - Staggered
  - No occlusion



Window Location: Examples

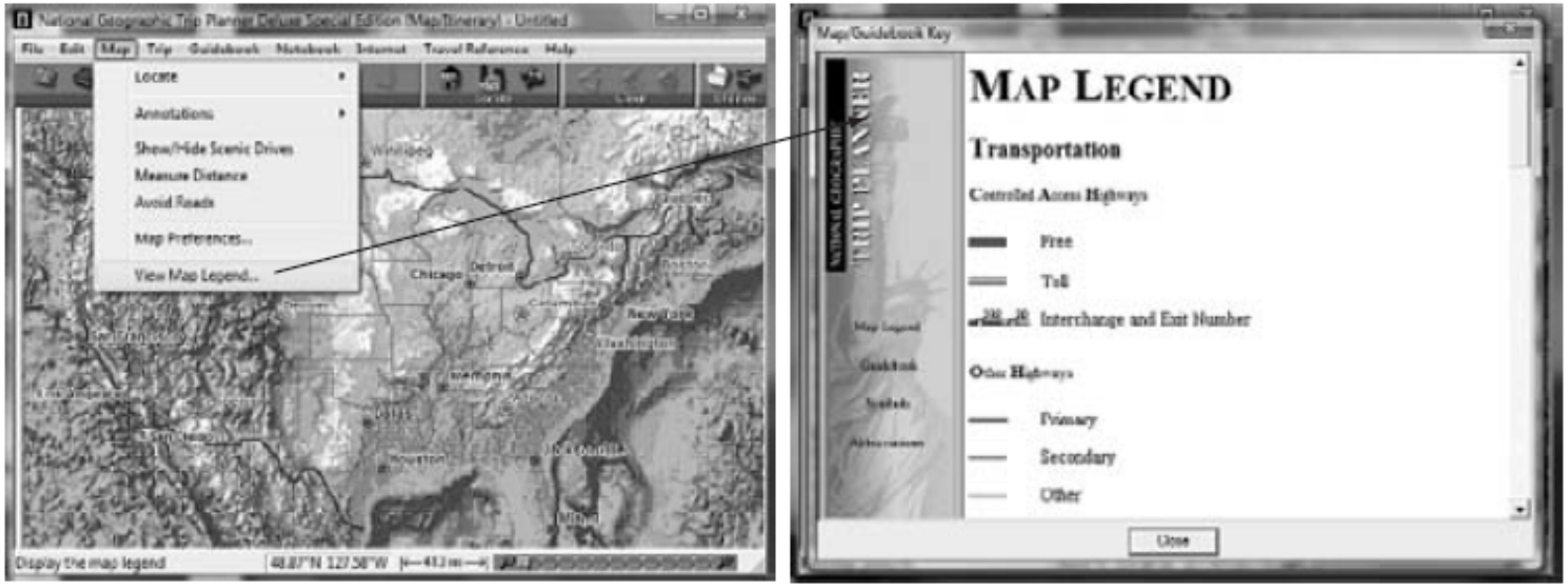
- Display all windows at the same coordinates



Blooper: all of an application's windows open at position [0, 0].

Window Location: Examples

- Displaying subordinate windows in middle of parent



National Geographic Trip Planner: map legend opens over map, making users move it.

Solutions

- Decide where each window appears
  - Don’t just let the OS decide or use [0,0]
- Optimal position depends on the type of window
  - Primary or informational?
- Stagger windows
- Make sure child windows don’t cover important information
- Don’t place windows directly on top of each other

Workshop Exercise

Graphical redesign of your journal

- large screen
- Small screen

Emphasise:

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

- Pair up and sketch your designs
  - 15 minutes
- Then pairs get together and critique each other's designs
  - What's wrong?
  - Why was <xyz> done that way?
- Identify 3 main issues with each
  - Pair report