Blackberry Fail

- Big fingers
  - Errors happen
- Send instead of backspace

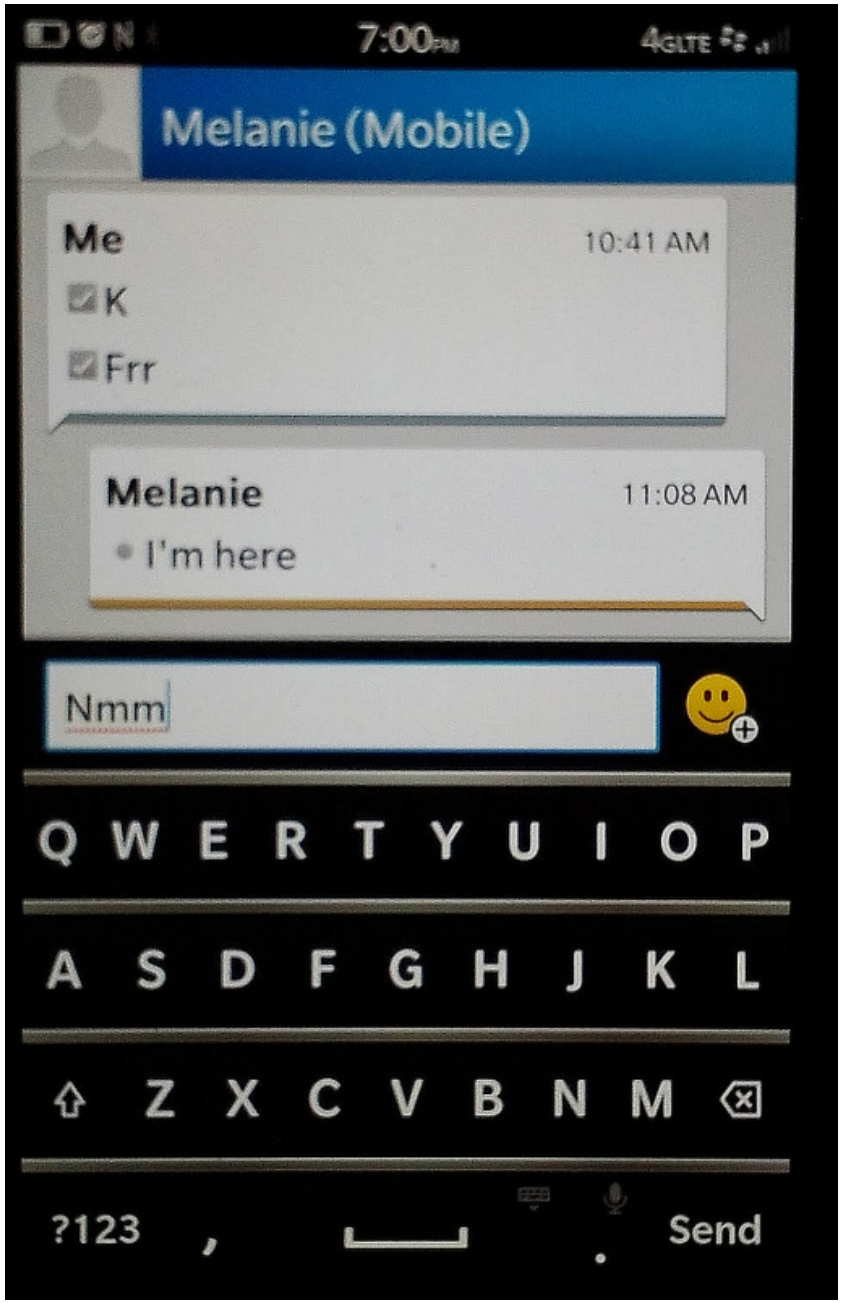
Phone:

Blackberry Z10

User:

15+years of experience

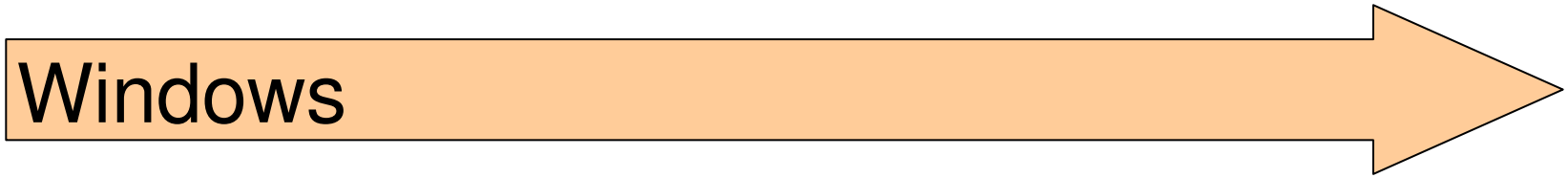
With mobiles



WIMP Elements

Outline

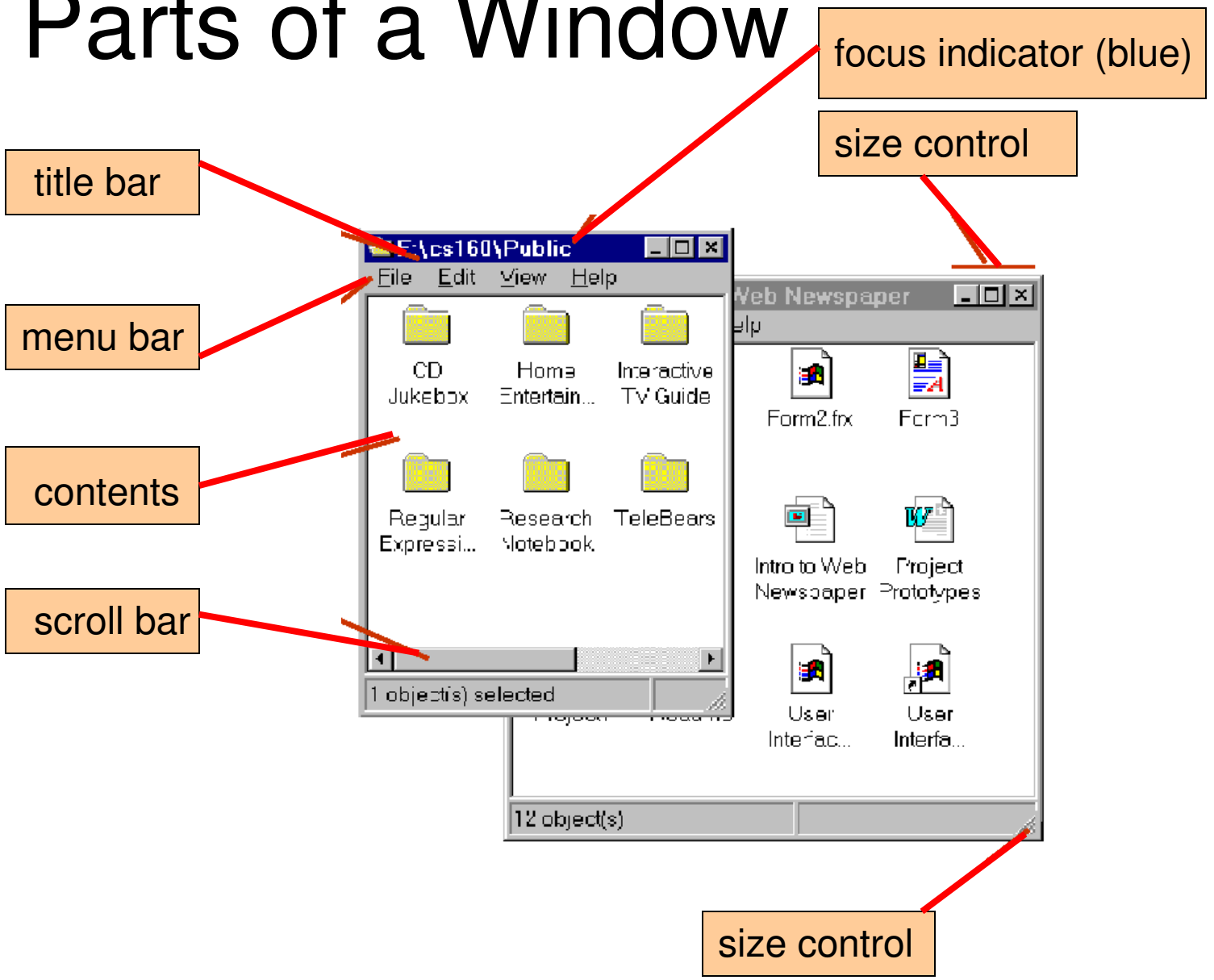
- Windows
- Icons
- Pointers
- Menus



Windows

- Windows are areas of the screen that act like individual terminals for an application
- Behaviour of windows determined by the system's window manager (aka windowing system)
- Windows can contain text, graphics, menus, toolbars, etc.
- Can be moved, resized, closed, minimized, maximized

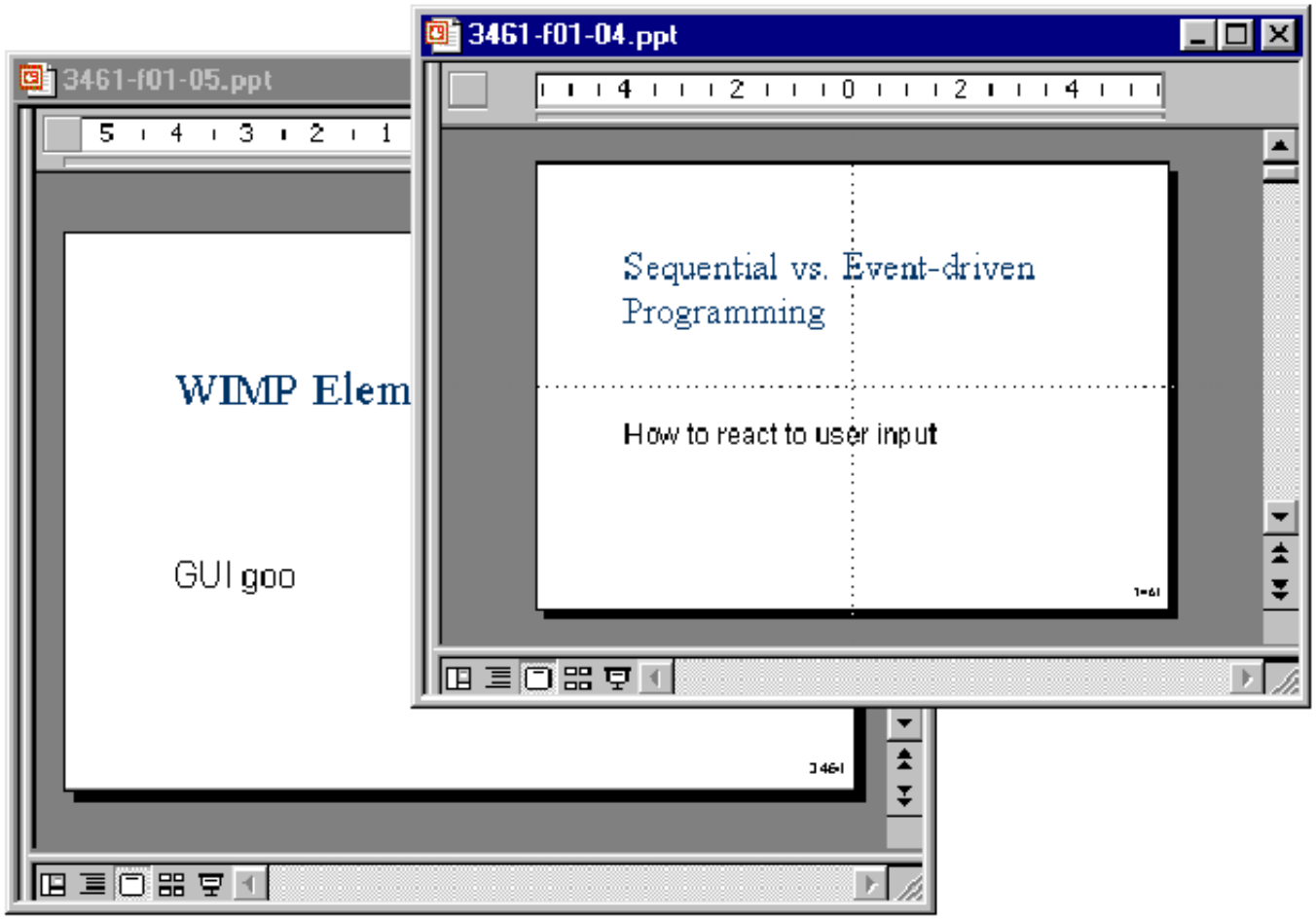
Parts of a Window



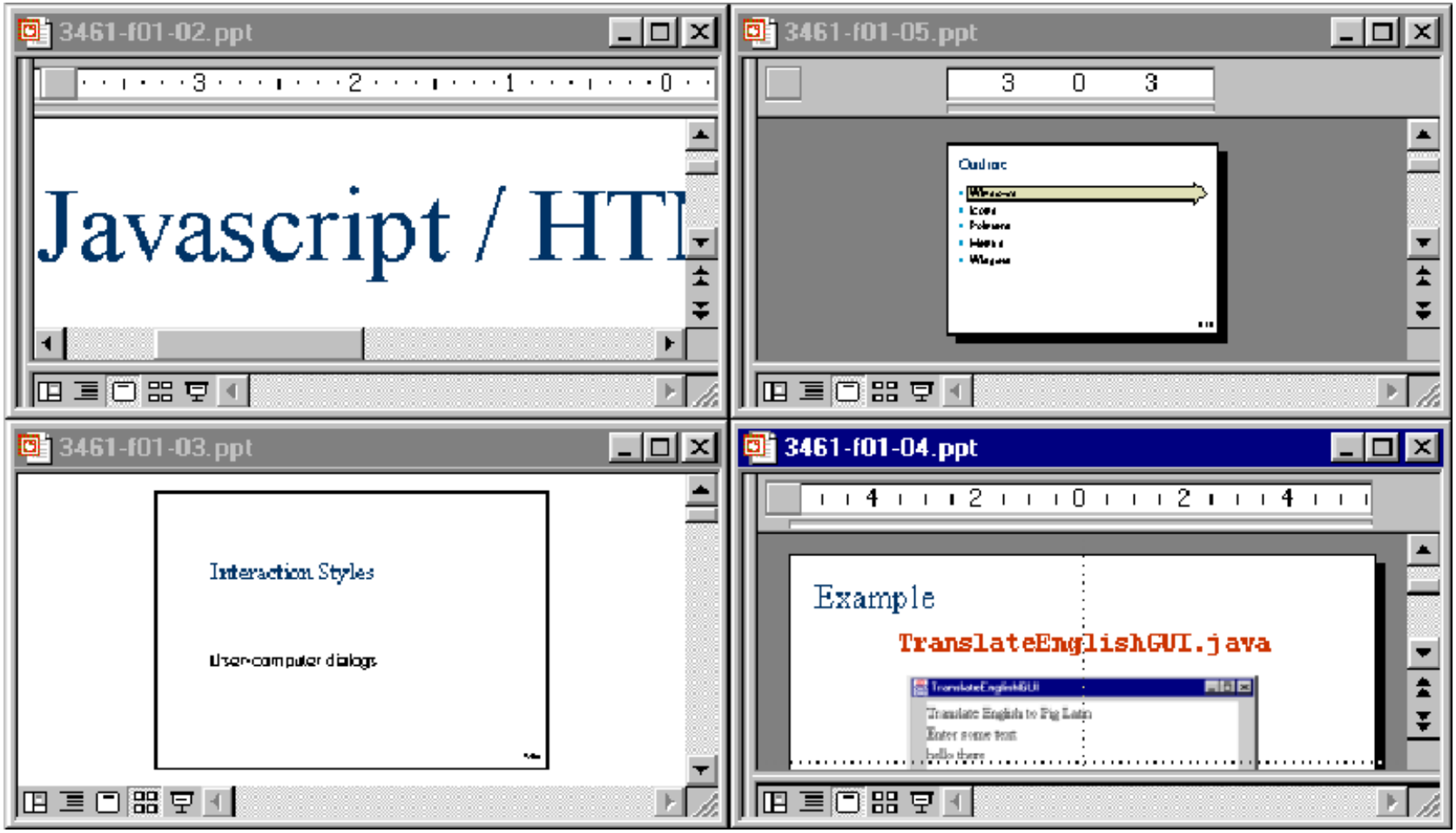
Layout Policy

- Multiple windows may exist simultaneously
- Physical arrangement determined by the window manager's layout policy
- Layout policy may be fixed or user-selectable
- Possible layouts include
  - Overlapping - One window partially obscures another
  - Tiled - Adjoin but don't overlap
  - Cascading – A sequence with each window offset from the preceding according to a rule (e.g., 10 pixels to the right and below)
- Let's see…

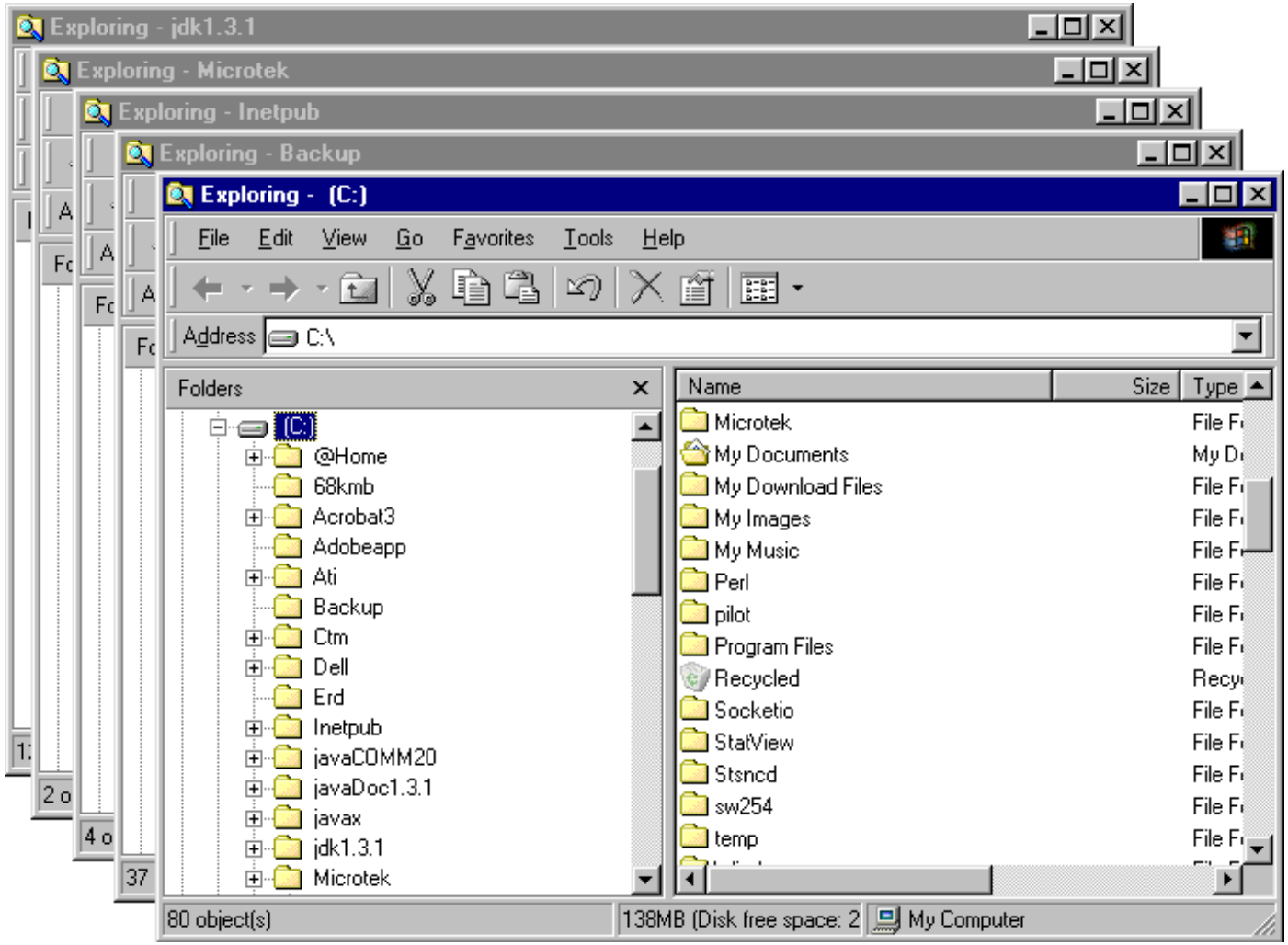
Overlapping Windows



Tiled Windows



Cascading Windows



Focus

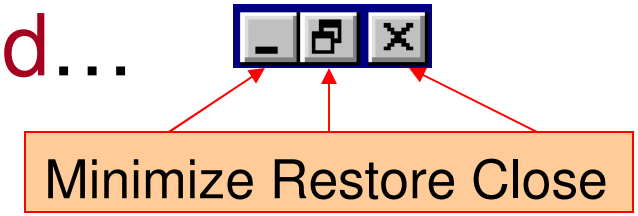
- The active window is said to have focus
- Title bar of active window is blue (or some other distinct colour)
- Title bars of inactive windows are grey
- Clicking in an inactive window makes it the active window (i.e., gives it focus)
- Screen must be redrawn to bring the active window to the front

Window Size States

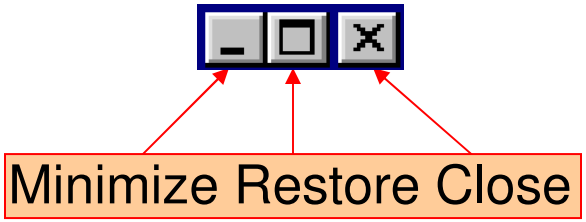
- Windows have three size states
  - Maximized
    - Fills available space
  - Minimizied
    - Reduced to a title bar or icon
  - Normal (aka Restored)
    - This is the size of the window, either when it was first opened, or before the window was maximized
    - From this mode, the window width and height may be adjusted

Window Size Control (*Windows*)

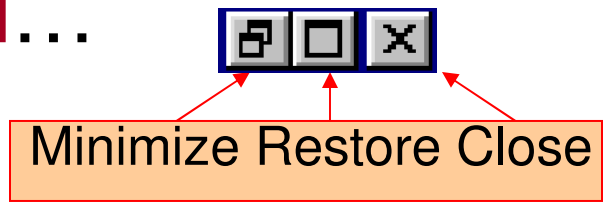
- Via boxes in upper-right corner of window
- When maximized…



- When restored…

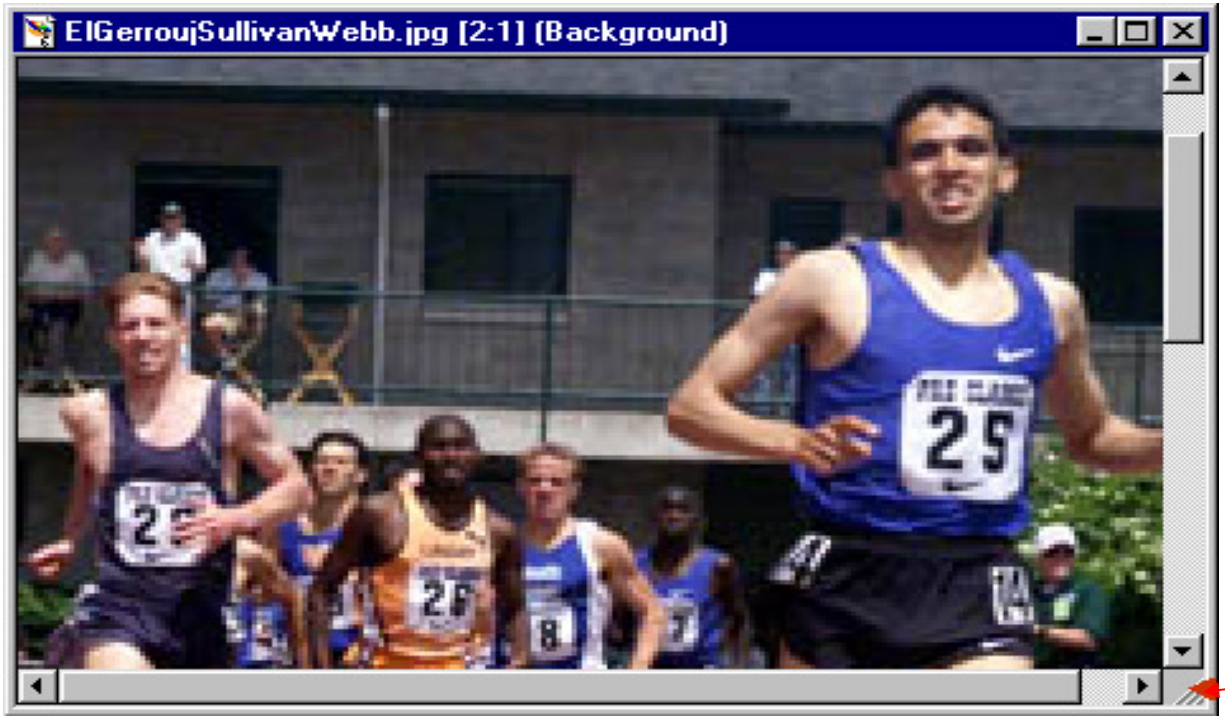


- When minimized…



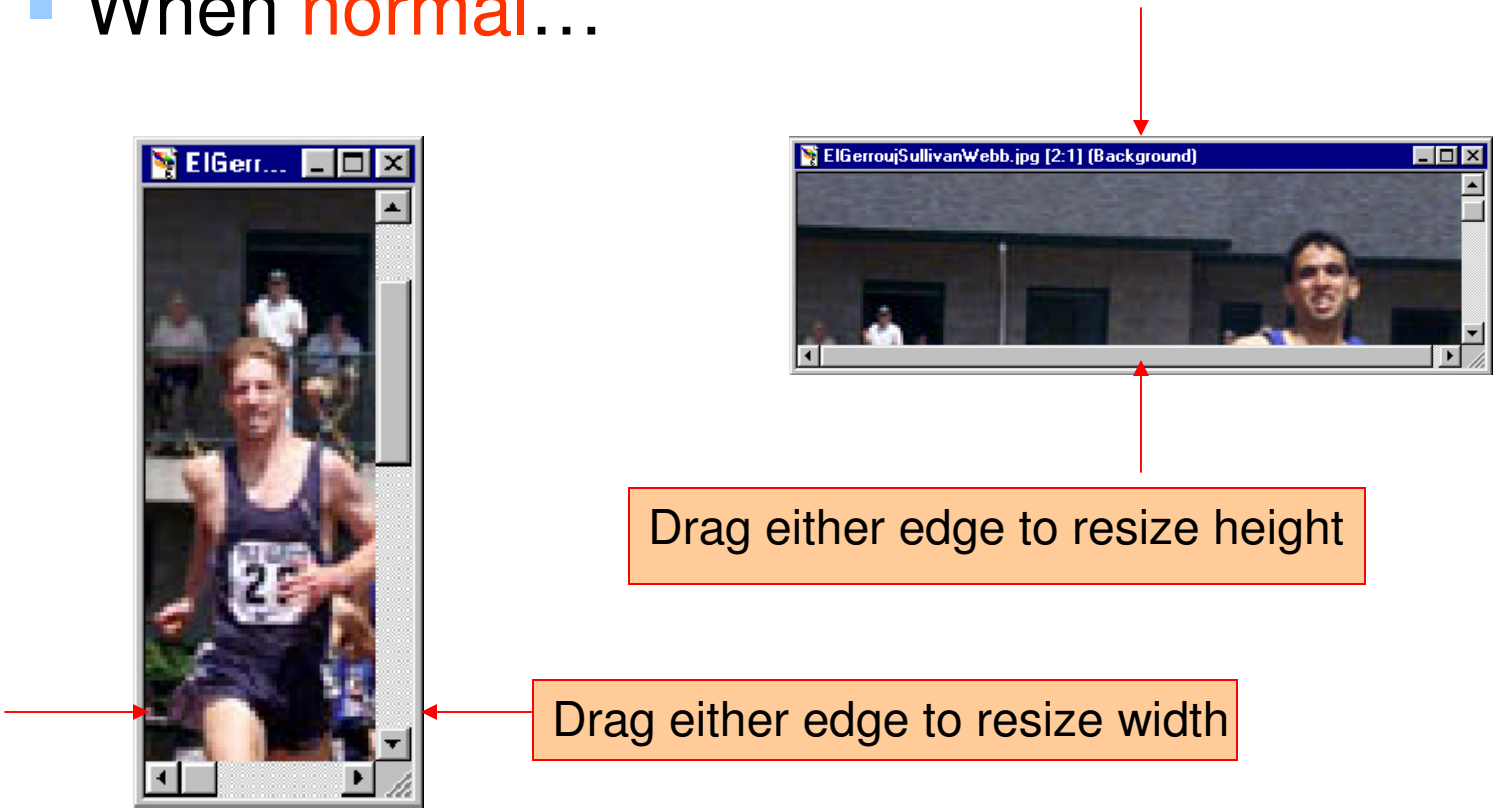
Window Size Control (2)

- Via handle in lower-right corner of window
  - When normal…



Window Size Control (3)

- Via virtual handles on edges
  - When normal…



Window Managers

- User interfaces are typically implemented within the framework of a window manager
  - Also known as windowing system or user interface management system (UIMS)
- Provides
  - Partitioning to prevent chaos on the screen (What if there was only one window shared by all applications?)
  - Layout policy
  - Infrastructure to support common services in building UIs

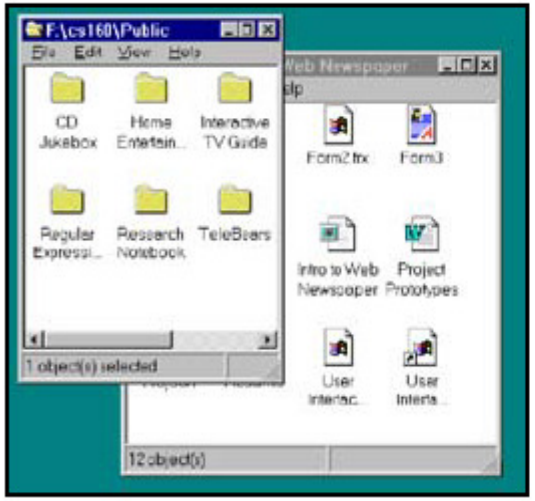
Window Manager Structure

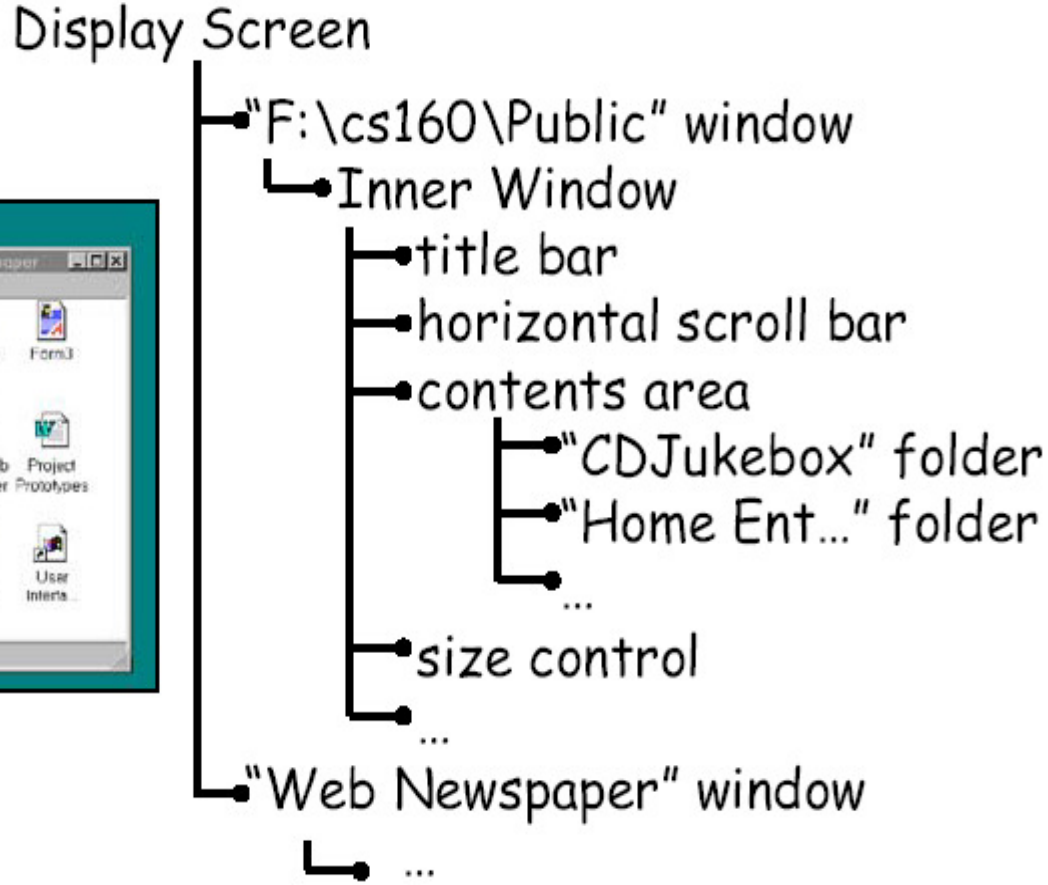
- Base layer (implements the basic infrastructure)
  - Output model (graphics primitives)
  - Input model (keyboard, mouse)
- UI layer (handles all visible aspects)
  - Presentation (e.g., what is on top?)
  - Commands (window & content manipulation)
- Mapping of input actions to applications
- When building a UI, use services of windowing system where possible (rather than writing custom code)

Containment Hierarchy

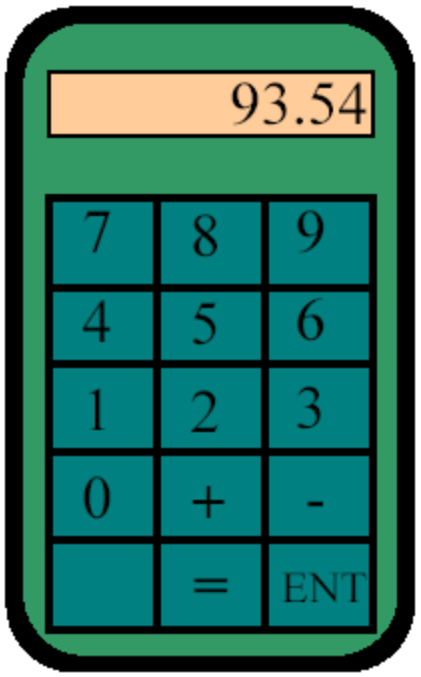
- A window contains a number of nested interactive objects (e.g.,buttons, text fields, other windows)
- Relationship of objects is expressed by a containment hierarchy (aka interactor tree)
  - based on screen geometry of objects
  - represents the hierarchy/nesting of the objects

Containment Hierarchy - Example 1





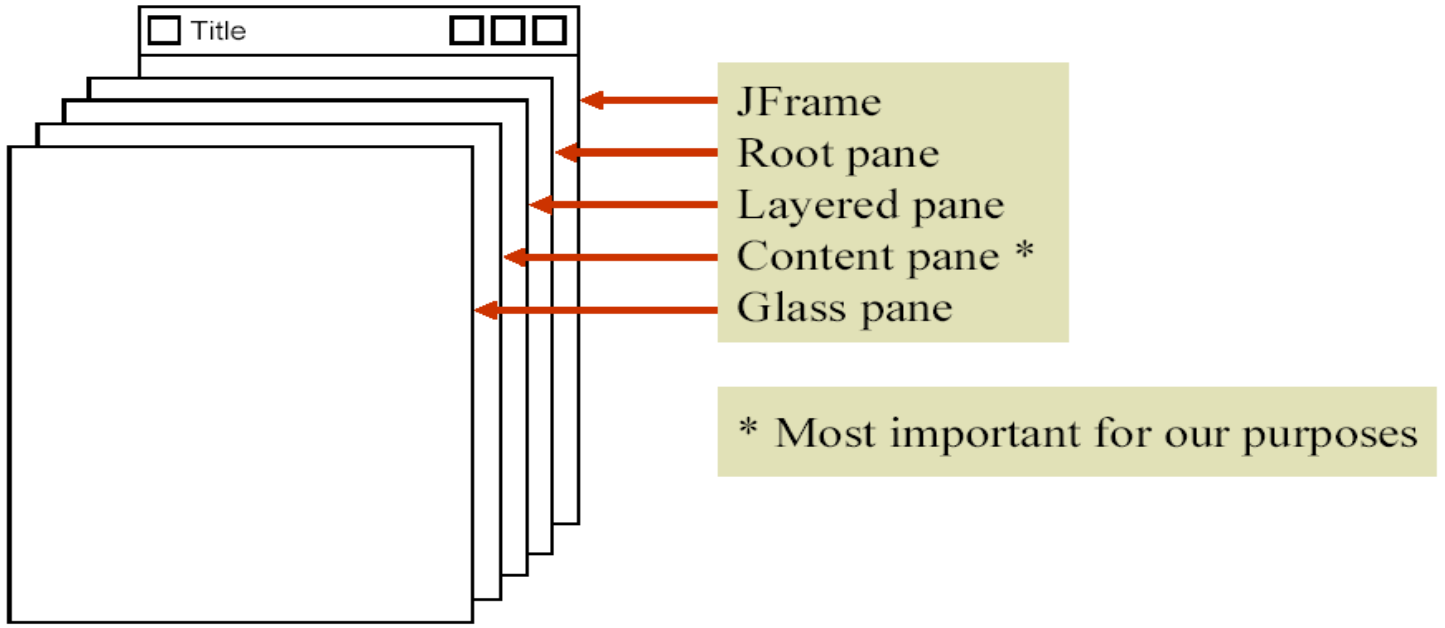
Containment Hierarchy - Example 2



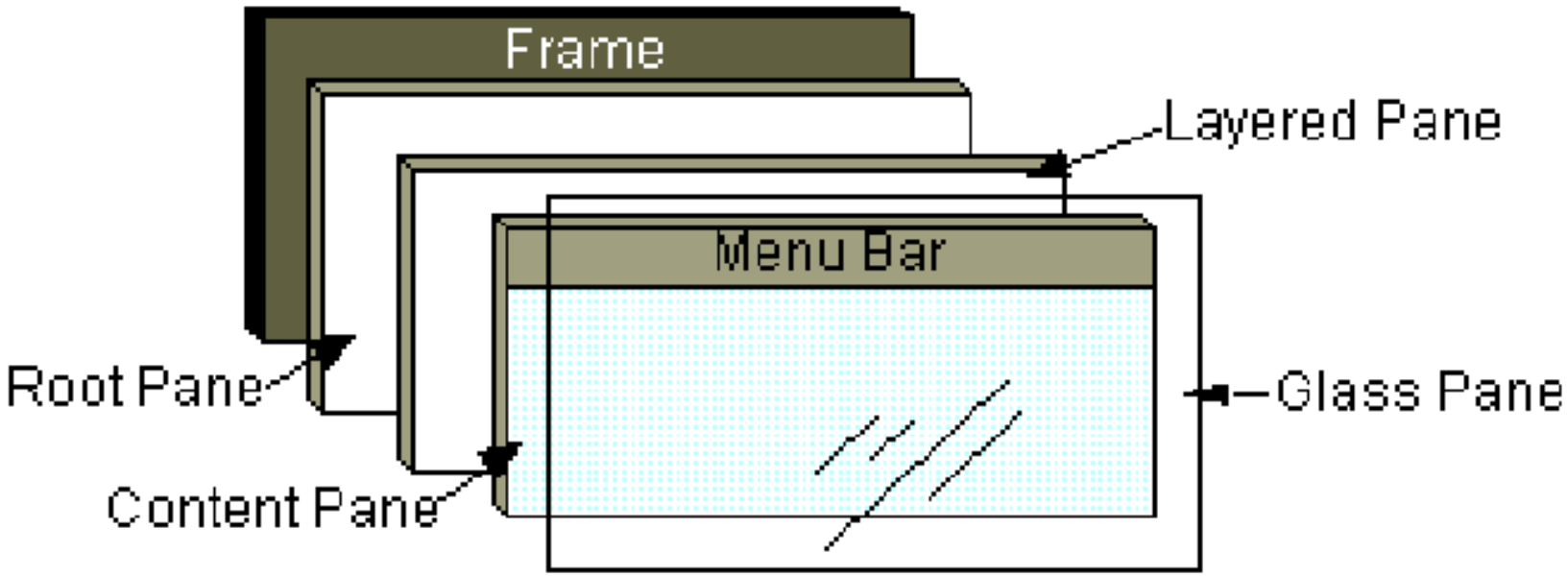
- Display Screen
  - Outer Win [*black*]
    - Inner Win [*green*]
      - Result Win [*tan*]
        - Result String
      - Keypad [*Teal*]
        - = button
        - - button
        - + button
        - **0** button

Java's Containment Hierarchy

- With JFC/Swing, the basic building block for a window is the JFrame and its associated panes



Java's Containment Hierarchy (2)



See "Using Top-Level Containers" in the Swing Tutorial

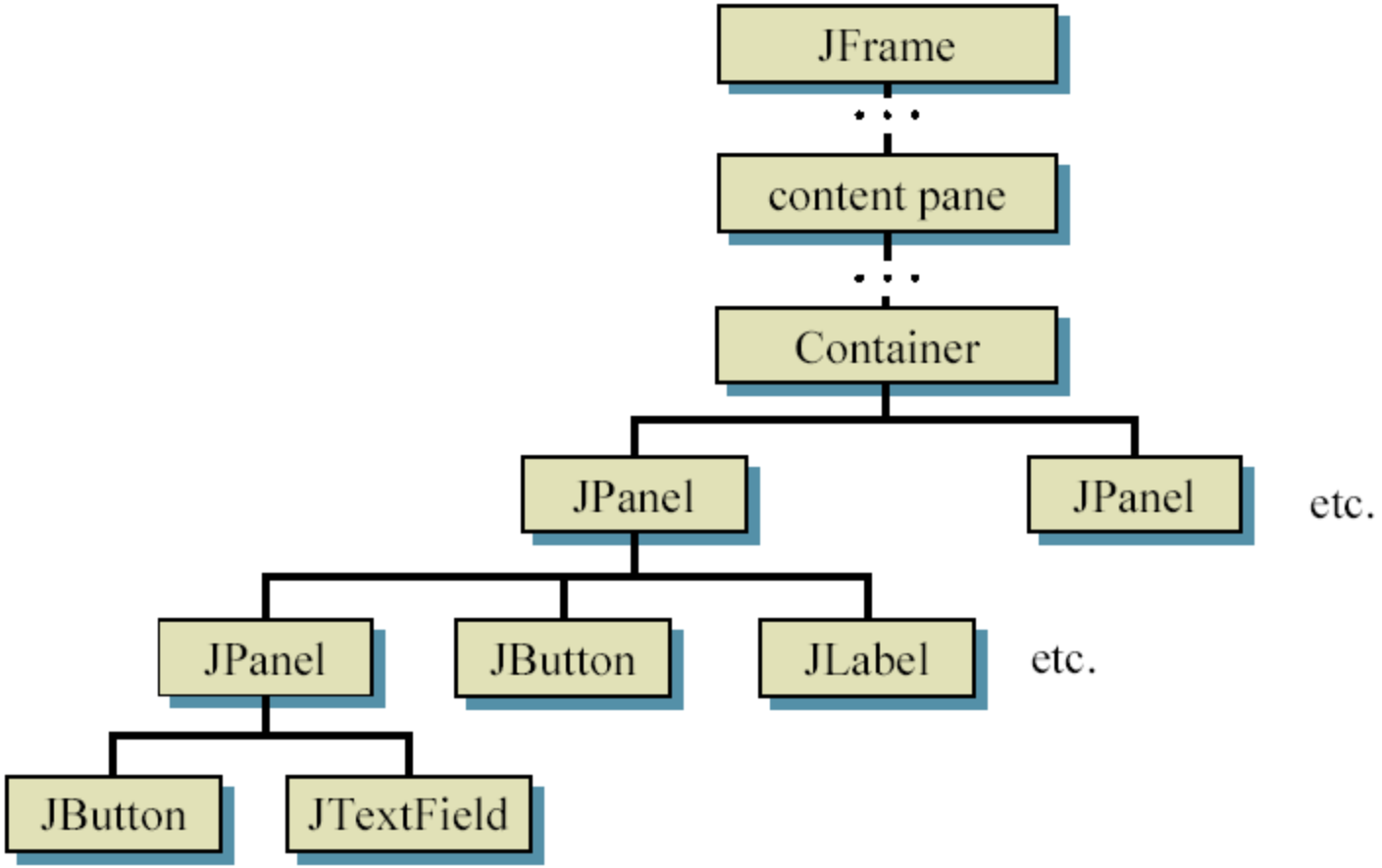
Containers

- Components are placed in containers
- A JFrame is a top-level container
  - It exists mainly as a place for other components to paint themselves
  - Other top-level containers are dialogs (JDialog) and applets
  - (JApplet)
  - Cannot place a JFrame inside a JFrame
- A JPanel is an intermediate container
  - Sole purpose is to simplify the positioning of interactive objects, such as buttons or text fields
  - Other intermediate containers are scroll panes (JScrollPane) and tabbed panes (JTabbedPane)
  - Can place a JPanel inside a JPanel (or inside a JFrame, via the content pane)

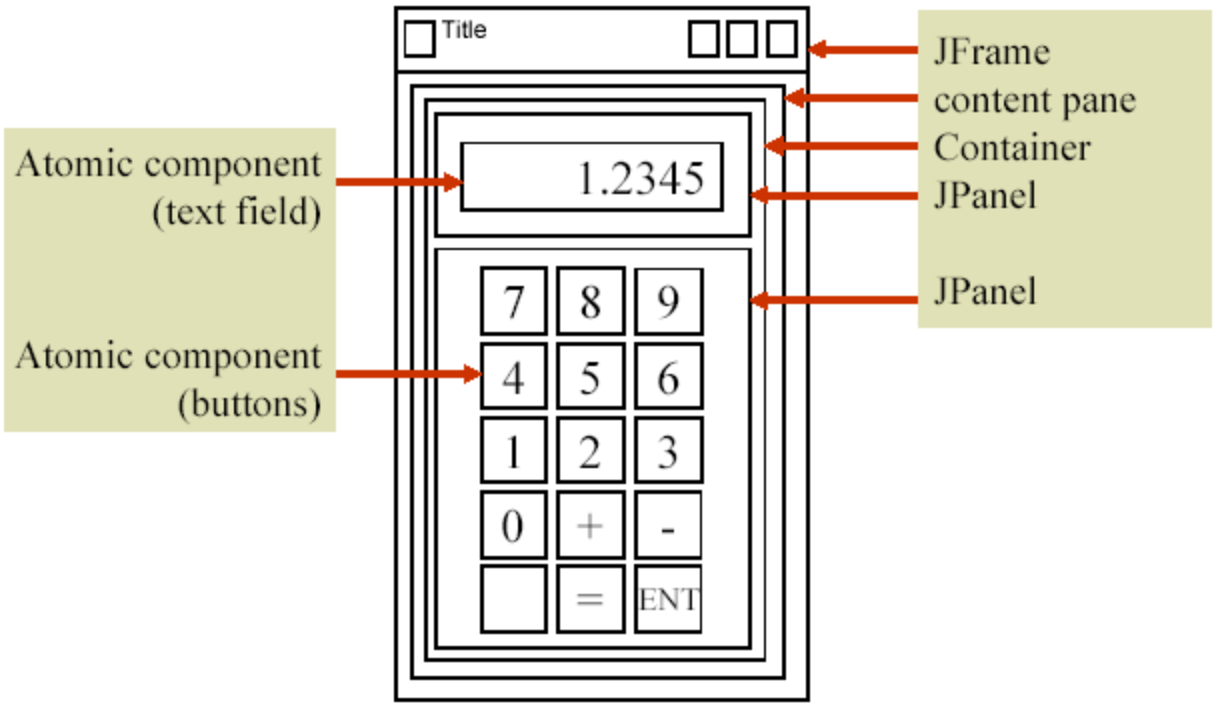
Atomic Components

- An atomic component is a component that exists solely to present and perhaps accept information
- Examples: buttons (JButton), text fields (JTextField), combo boxes (JComboBox)
- JFrame and JPanel are also components, however…
  - They can hold other components
  - An atomic component cannot hold other components

Containment Hierarchy for JFC/Swing

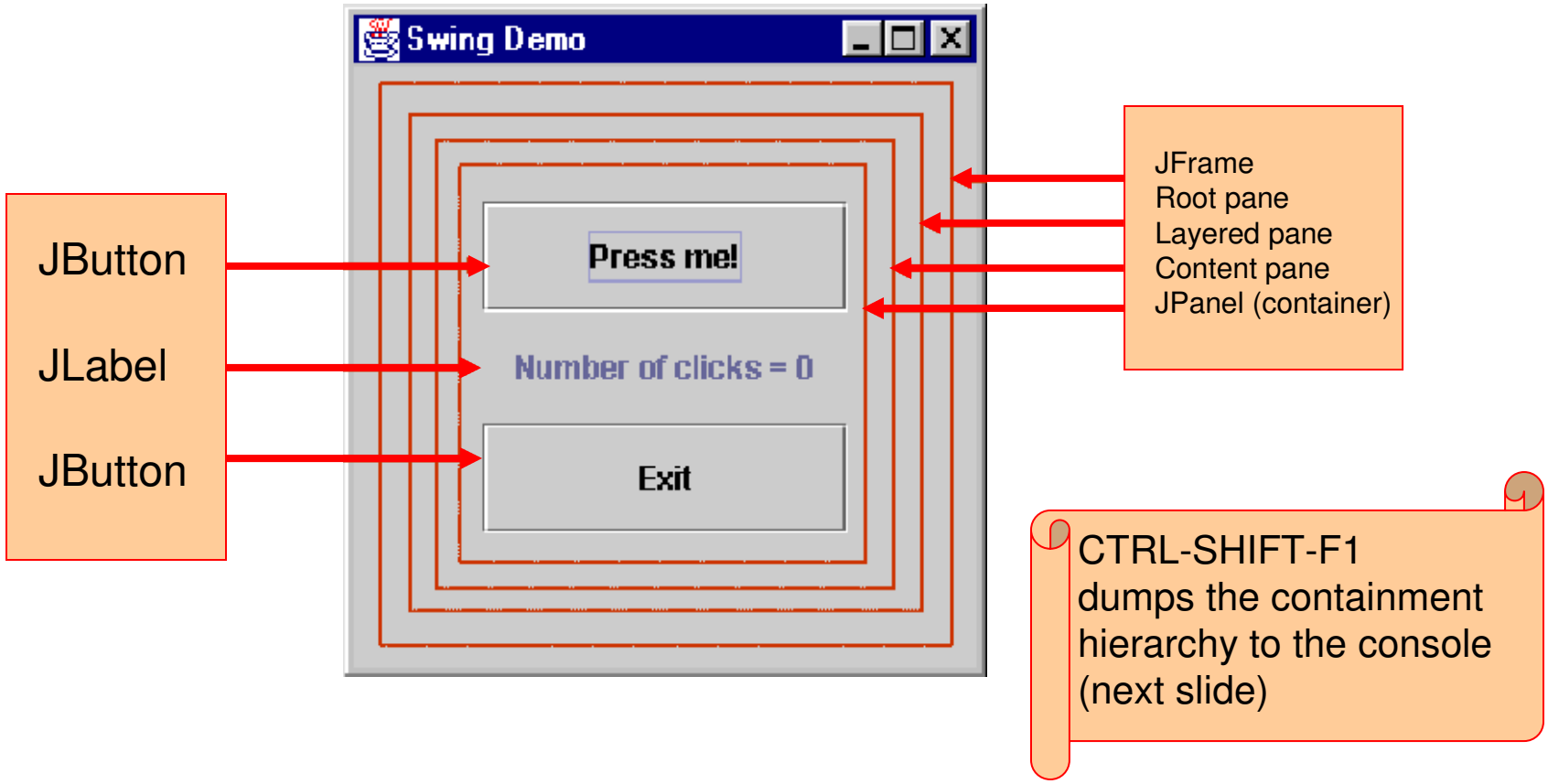


So…


Title
1.2345
7
8
9
4
5
6
1
2
3
0
+
-
=
ENT
Atomic component
(text field)
Atomic component
(buttons)
JFrame
content pane
Container
JPanel
JPanel

Example Program

DemoSwing.java



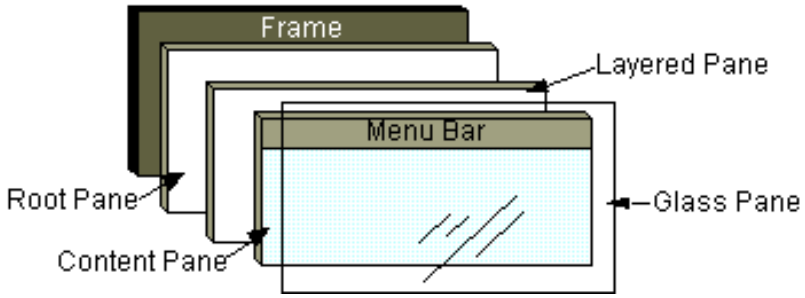
Containment Hierarchy (abbreviated) for DemoSwing.java

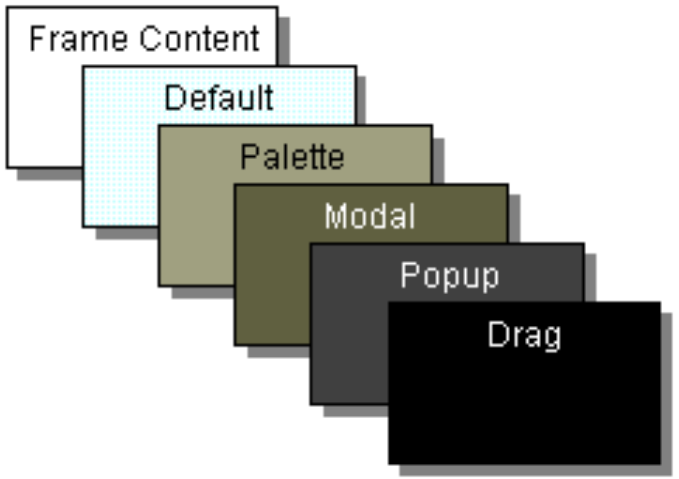
```
DemoSwingFrame[frame0,0,0,121x128, ...
    javax.swing.JRootPane[,4,23,113x101, ...
        javax.swing.JPanel[null.glassPane,0,0,113x101, ...
        javax.swing.JLayeredPane[null.layeredPane,0,0,113x101, ...
            javax.swing.JPanel[,0,0,113x101, ...
                javax.swing.JButton[,10,10,93x27, ...
                javax.swing.JLabel[,10,37,93x27, ...
                javax.swing.JButton[,10,64,93x27, ...
```

More Info

- **How to Use Root Panes**

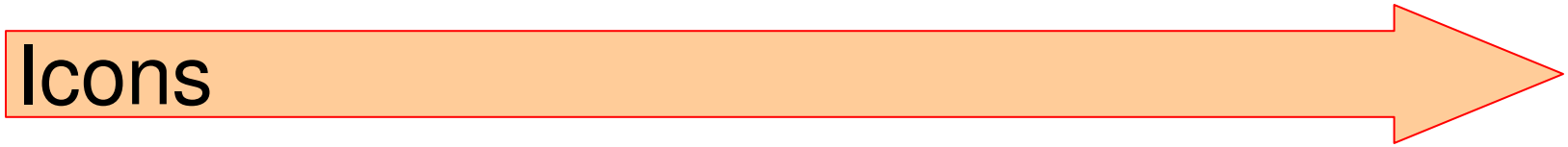
  http://docs.oracle.com/javase/tutorial/uiswing/components/rootpane.html





Outline

- Windows
- Icons
- Pointers
- Menus
- Widgets



What is an Icon

- From Webster's dictionary:
  - Icon: *a pictorial representation*
- A window may be closed and lost forever, or…
  - Shrunk to a reduced representation
  - The reduced representation is called an icon
- The act of reducing a window to an icon is called iconifying or minimizing
- A window may be restored by clicking on its icon
- Advantages of icons…
  - Save screen space
  - Serve as a reminder of available dialogs, applications, or commands that may be restored or invoked

Icons Are Used to Represent…

- Disk drives

- Available applications

- Miminized applications

- Minimized windows

- Folders

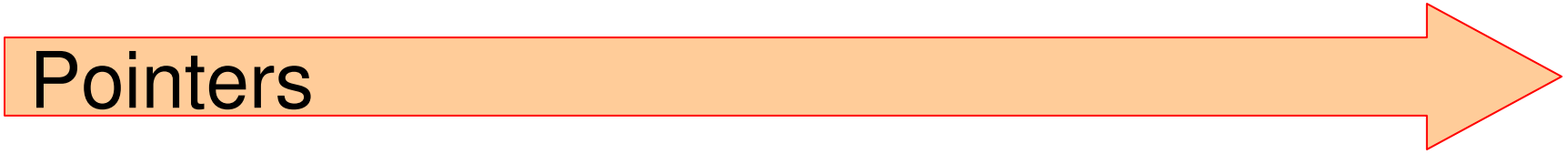
- Files

- Commands

- States

Outline

- Windows
- Icons
- Pointers
- Menus



What is a Pointer?

- A pointer is the input device used to interact with GUI components
  - E.g., mouse, trackball, joystick, touchpad, finger, stylus, light pen
- Two primary purposes
  - Position control of the on-screen tracker
  - Selection via buttons

Direct vs. Indirect Input

- Direct input
  - Via finger, stylus, light pen
  - No spatial displacement between input device and display
  - Tracker generally not needed
  - Selection via tapping or pressing
- Indirect input
  - Via mouse, joystick, or trackball
  - Spatial displacement between input device and display
  - Tracker needed
  - Selection via button presses

Selection Primitives

- Generally, at least two buttons on pointing devices
- Selection primitives
  - Primary button (default = left)
    - Single click – select
    - Double click – launch
    - Drag – select region
  - Secondary button (default = right)
    - Click – invoke context-sensitive menu

Tracker

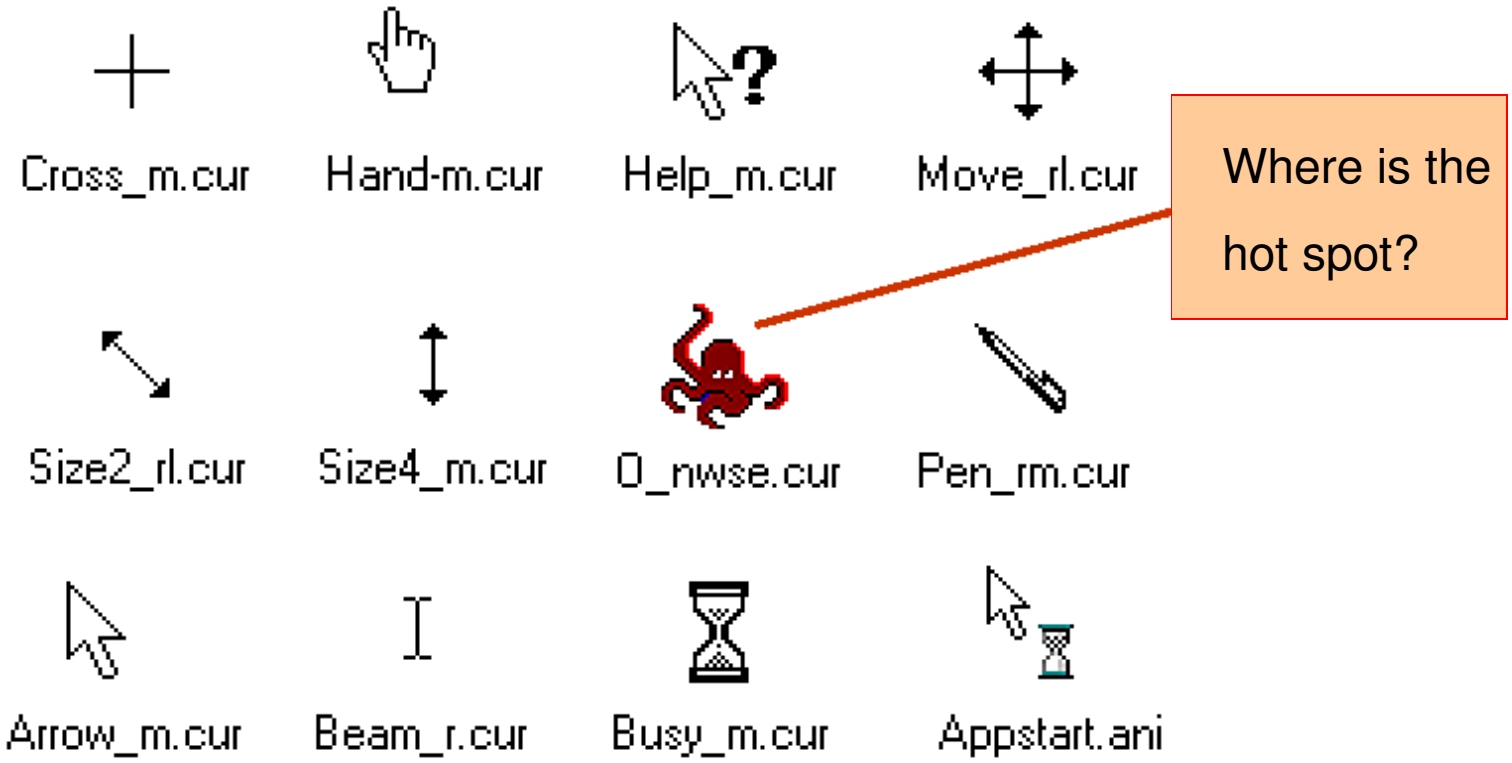
- The on-screen symbol that follows ("tracks") the motion of the input device is called a tracker (aka cursor)
- Two primary purposes
  - Position indicator – crucial feedback for input control
  - State indicator – reveals current state of the system or GUI component

Tracker Hot Spot

- The tracker is a bit-mapped image (*x* by *y* pixels)
- One pixel in the image is defined as the hot spot
- Selection occurs at the coordinate of the hot spot
- When designing custom trackers, use an image with an obvious hot spot if selection is required while the tracker is displayed

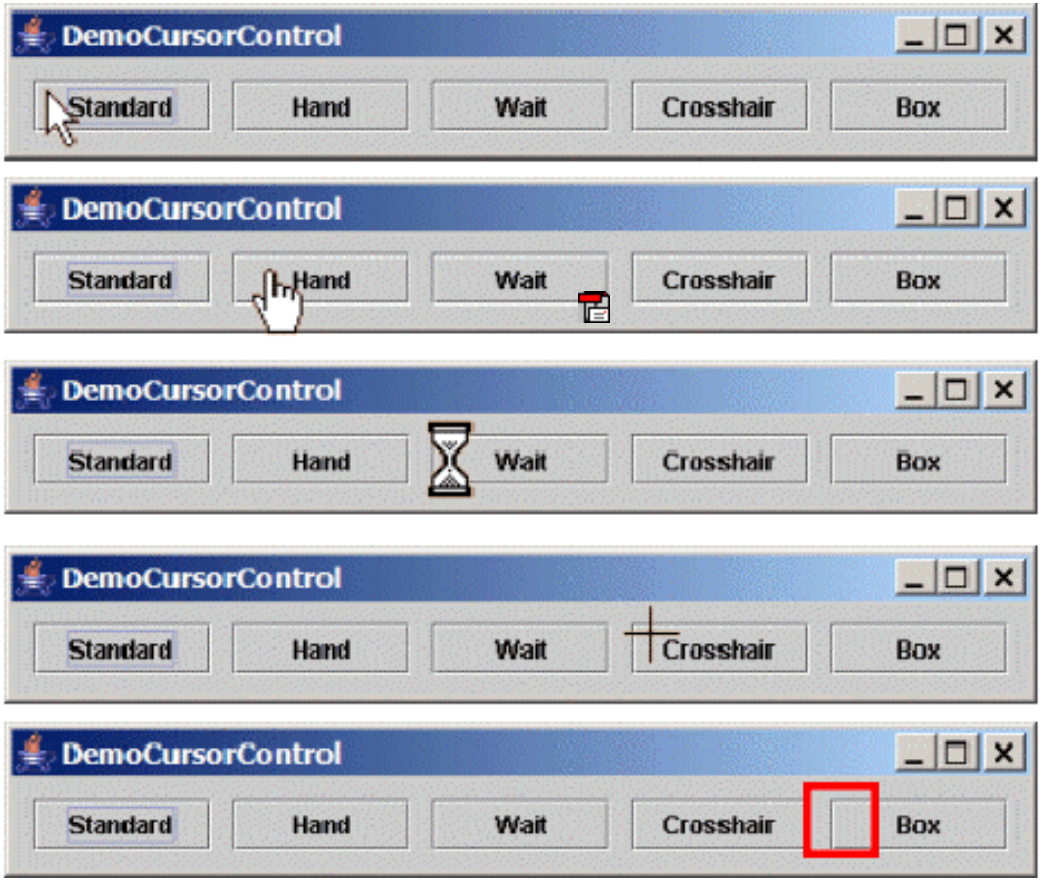
Tracker Examples

- Examples from MS Windows



Example Program

DemoCursorControl.java



Outline

- Windows
- Icons
- Pointers
- Menus

What is a Menu?

- A means of presenting a choice of operations that can be performed by the system at a given time
- Main advantage:
  - Menu options are recognized rather than recalled
  - Human ability to recognize is superior to ability to recall
  - Example of recall: *Who is the captain of the Maple Leafs?*
  -
  -
- Menus typically navigated two ways
  - Keyboard
  - Pointing device

What is a Menu?

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  - Menu options are recognized rather than recalled
  - Human ability to recognize is superior to ability to recall
  - Example of recall: *Who is the captain of the Maple Leafs?*
  - Example of recognition: *The captain of the Maple Leafs is (a) Tie Domi (b) Matts Sundin, (c) Darcy Tucker, (d) Steven Harper.*
- Menus typically navigated two ways
  - Keyboard
  - Pointing device

Menu Location

- Most application windows include a menu bar directly below the title bar

Menu Design Techniques

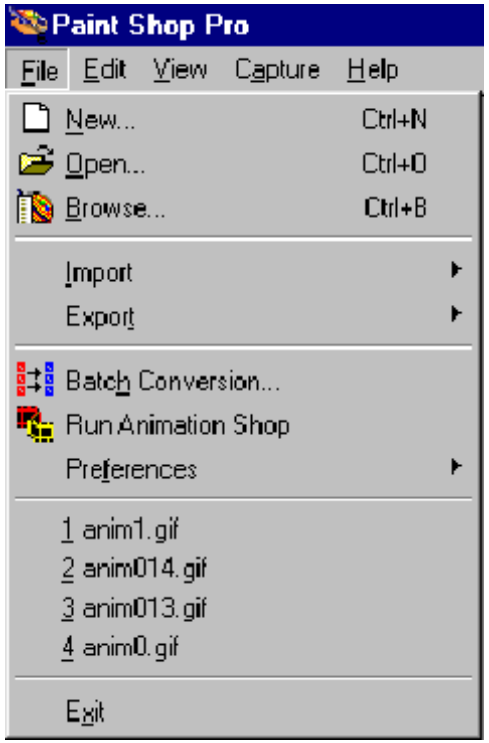
- Numerous techniques are used to design effective menus
- Many are accompanied by visual indicators
  - Serve as signal to the user
- Menus features
  - Cascading submenus
  - Groupings
  - Dialog boxes
  - Icons
  - Keyboard input
    - Mnemonics
    - Accelerators
  - Popup menus

Cascading Menus

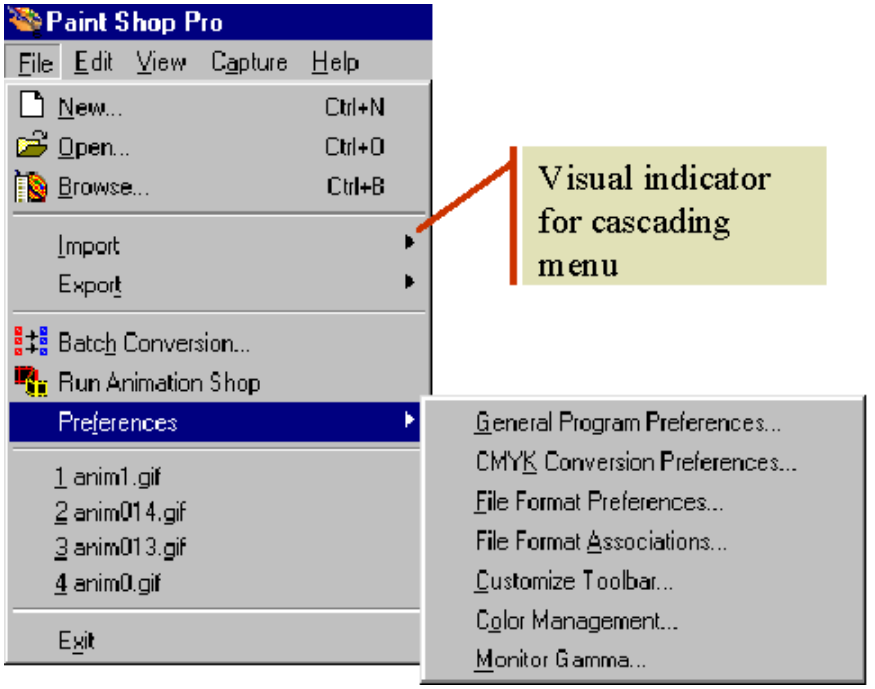
- Menus are inefficent if they contain too many items
- One solution is to use cascading menus (aka submenus)
- Selecting an item opens up another menu adjacent to selected item
- Several layers of cascading menus may be used
- Visual indicator: triangle
- Example

Example

File menu

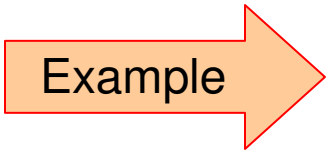


File menu with focus on Preferences



Groupings

- Similar items are grouped together in a menu
- Visual indicator: separator (i.e., line)



Color menu

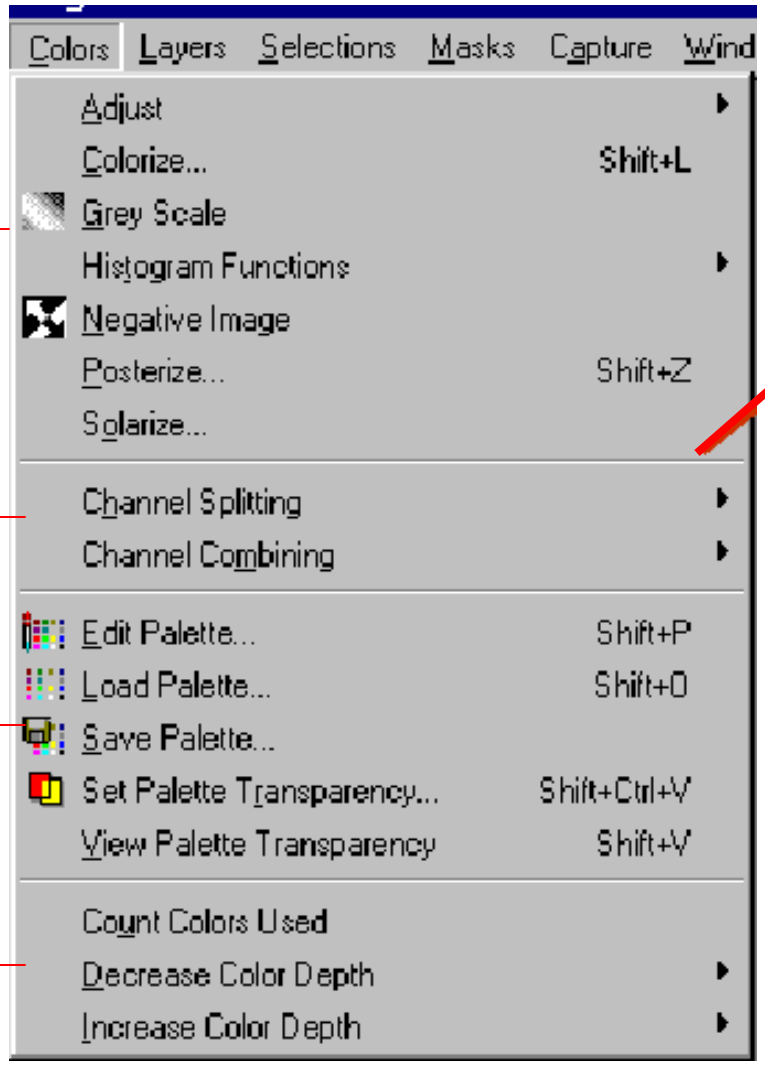


Image adjust group

Channel group

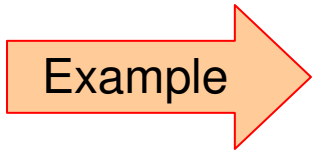
Palette group

Color depth group

Visual indicator for group

Dialog Boxes

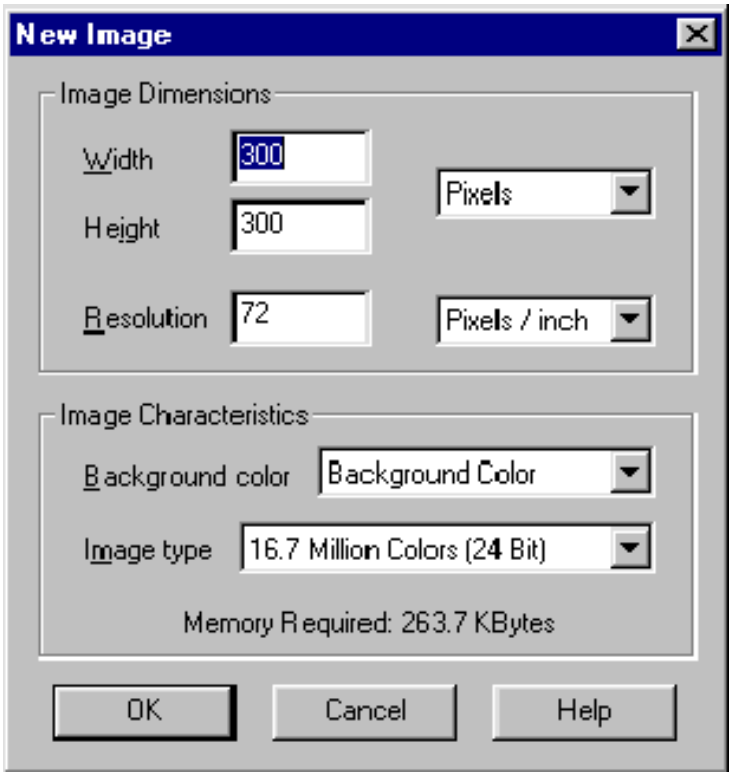
- A Menu choice that involves the collection of input parameters can use a dialog box
- May contain a message, editable fields, buttons, etc.
- Types of dialog boxes
  - File (open, new, save as)
  - Print
  - Color chooser
- Visual indicator: Ellipsis (…)



File menu

Visual indicator for dialog box

"New" dialog box

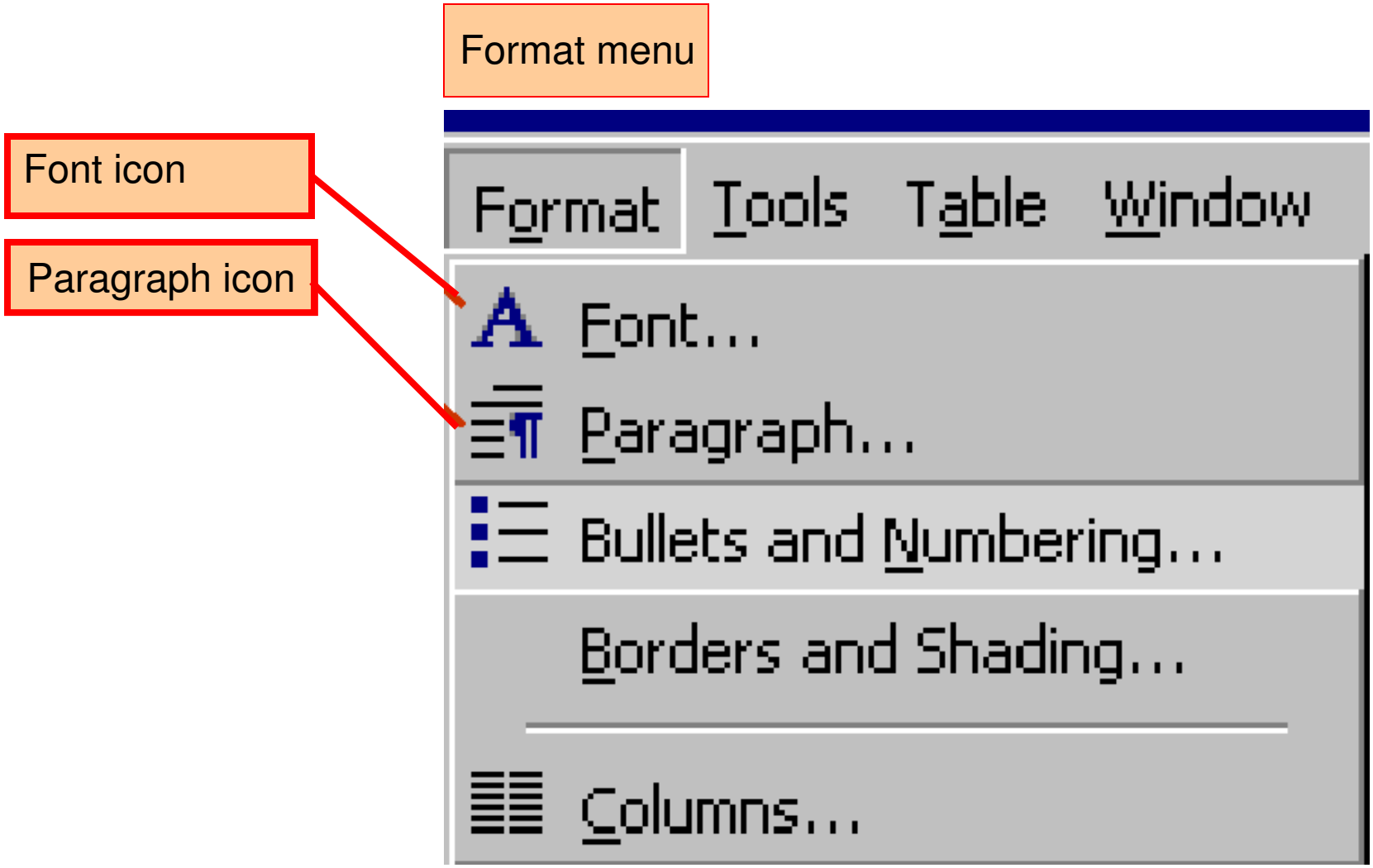


Icons in Menus

- Menu items typically contain words as labels
- Two problems with words as labels:
  - Culturally biased
  - Often poorly express the purpose of the choice
- Icons are used to suggest purpose
- Example…

- Icons can be used as, or added to, menu items for the same reason

Example


Format menu
Font icon
Paragraph icon
Format
Tools
Table
Window
Font...
Paragraph...
Bullets and Numbering...
Borders and Shading...
Columns...

Keyboard Input for Menu Navigation

- Besides using a pointing device, most menus support keyboard input
- Best for expert/frequent users (because they are better at *recall*. For novices, *recognize* is better.)
- Typically use function keys or modifier keys (shift, control, alt)
- In many settings, systems are required to support full interaction using only a keyboard for input
  - The goal: Accessibility for people with disabilities

Mnemonics vs. Accelerators

- Two techniques for keyboard menu navigation: mnemonics and accelerators
  - Mnemonics
    - The full menu hierarchy may be accessed using only the keyboard
    - An underlined single letter serves as the mnemonic
    - Alt-*letter* to initiate mnemonic access
  - Accelerators
    - Shortcuts to bypass the menu hierarchy and directly invoke a menu option

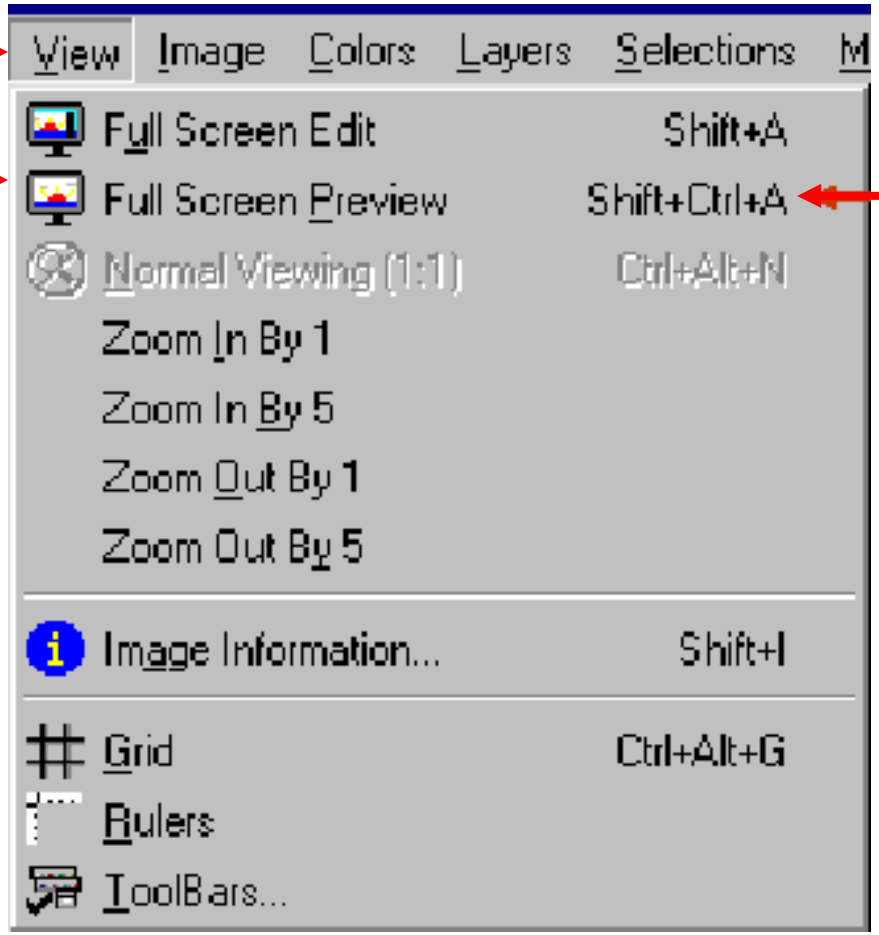
Example

Two keyboard techniques to invoke the “Full Screen Preview” command in the “View” menu

Using mnemonics:
Alt-v

p

View menu



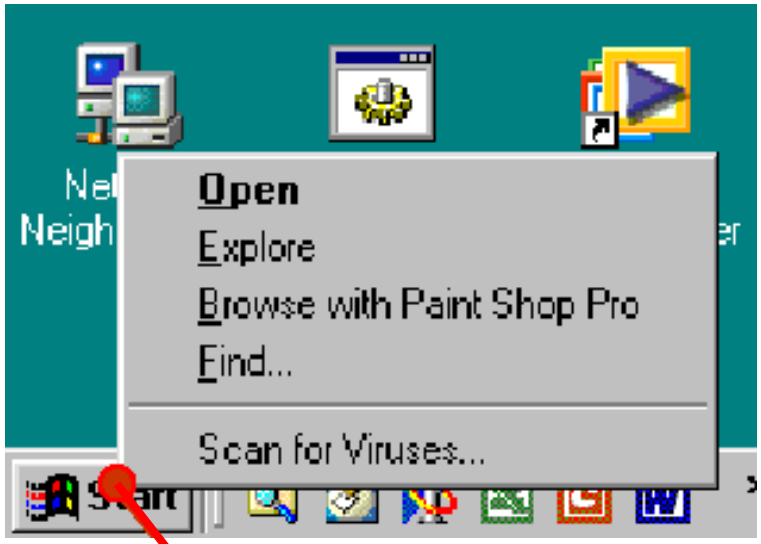
Using accelerator:

Shift-Ctrl-A

Popup Menus

- Invoked anywhere by right-clicking on mouse button
- Menu that pops up is context sensitive (i.e., depends on where the tracker is when the mouse button is clicked)

Context sensitive popup menus on *Windows* desktop.



Right-click on Start button

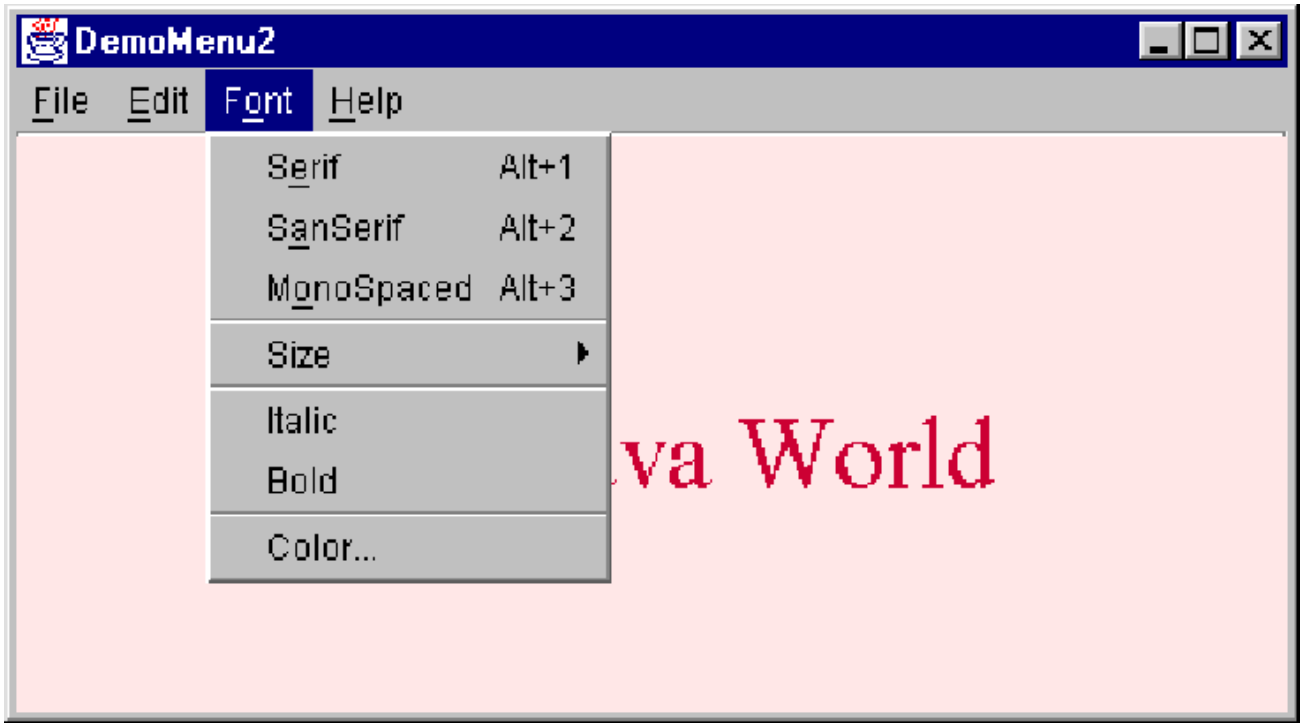
Right-click on background

Example Program

DemoMenu.java

Example Program

DemoMenu2.java

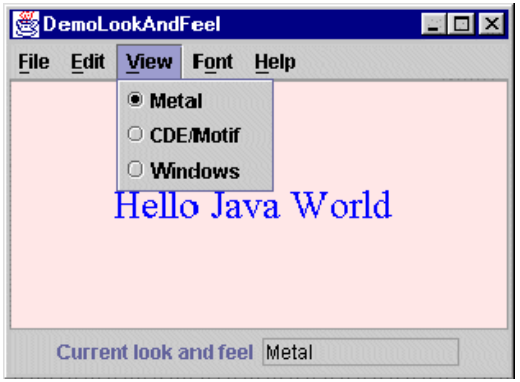


Note: uses Win32 Look and Feel

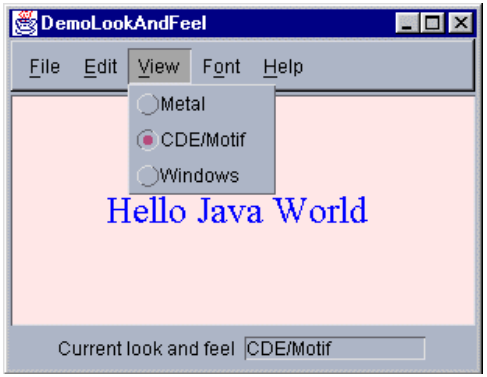
Example Program

DemoLookAndFeel.java

Metal (java)



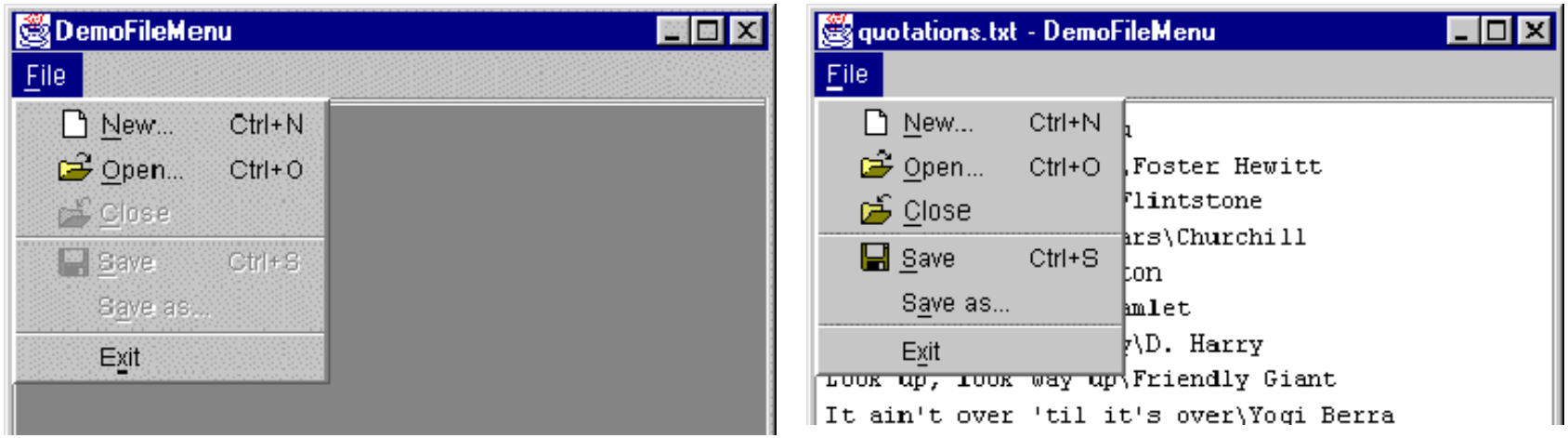
Motif



Windows

Example Program

DemoFileMenu.java



Next Topic…