Chapter 14 Overview

- Windowing systems and general organizational metaphors
- Windowing system basics
  - components
  - common tasks
- Multi-user support

Windowing systems

- Windows: areas of visual display (usually rectangular) that divide the physical display area into several virtual display areas.
- Windowing system
  - manages input and output resources (e.g., screen display and input devices)
  - supports management operations on windows (and multiple windows) such as move, resize, scroll, transfer data between
- Originated with Doug Engelbart; developed at Xerox PARC; popularized by Apple Lisa/Macintosh
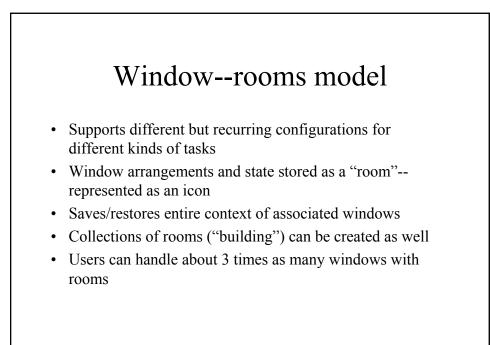
Windowing systems

- Benefits
  - optimize use of display space (screen real estate)
  - use multiple sources simultaneously to carry out a task
  - multiple views of an item of interest
  - coordinate use of input devices for various different purposes
  - windows give visual and textual context for different kinds of interaction
  - shield users from command languages. specification by pointing and selecting
  - standardize interface across many applications. ease learning for new applications
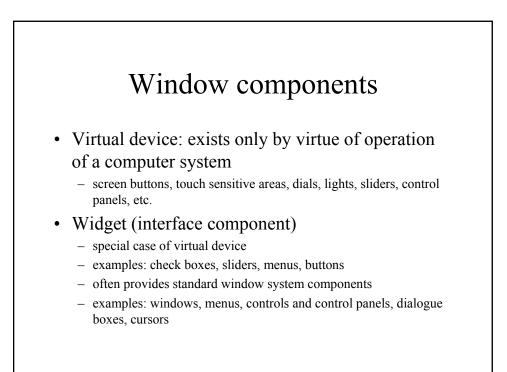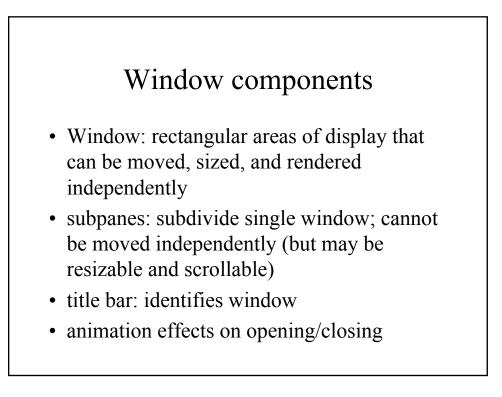
Window working set

- Window working set: the set of windows needed to carry out a particular task effectively
- Window working set must fit unobscured on physical screen or time wasted in searching, reorganizing, manipulating
- One approach: arrange windows in advance
- Another approach: Rooms model

Window--rooms model

- Supports different but recurring configurations for different kinds of tasks
- Window arrangements and state stored as a "room"-- represented as an icon
- Saves/restores entire context of associated windows
- Collections of rooms ("building") can be created as well
- Users can handle about 3 times as many windows with rooms

Windowing systems-- implementation issue

- Imaging model: bitmap or mathematical description of curves
- Bitmaps
  - faster to draw
  - difficult to scale (enlarge or reduce)
  - difficult to rotate arbitrarily
- Mathematical description of curves
  - examples include PostScript, Metafont

Window components

- Virtual device: exists only by virtue of operation of a computer system
  - screen buttons, touch sensitive areas, dials, lights, sliders, control panels, etc.
- Widget (interface component)
  - special case of virtual device
  - examples: check boxes, sliders, menus, buttons
  - often provides standard window system components
  - examples: windows, menus, controls and control panels, dialogue boxes, cursors

Window components

- Window: rectangular areas of display that can be moved, sized, and rendered independently
- subpanes: subdivide single window; cannot be moved independently (but may be resizable and scrollable)
- title bar: identifies window
- animation effects on opening/closing

Window components--menus

- Menus
  - implicit or explicit pop-up menus
  - submenus provide hierarchy
    - hierarchical pop-up menus
  - common gestural syntaxes for menu selections
    - press-drag-release
    - click-position-click
  - dialogue box to complete some menu actions
  - visual feedback
    - showing currently selected items via highlighting
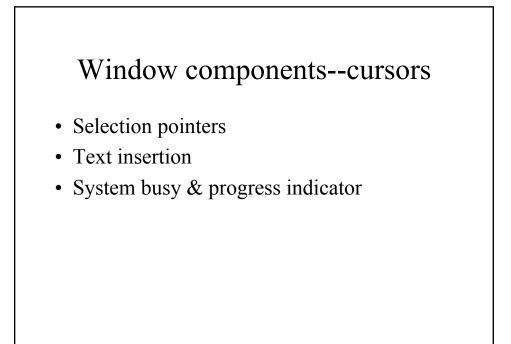   - greying out to indicate inactivity

Window components--control panels

- Control widgets
  - buttons, sliders, gauges, dials
    - inclusive check boxes, exclusive check boxes (radio button), sliders, display lock, etc.
  - text fields
  - dynamic menus
    - contents determined at runtime
- Immediate controls and controls subject to confirmation
  - default values

Window components--dialogue boxes
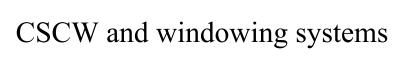
- Dialogue boxes
  - modal and modeless dialogue boxes
    - modal dialogue boxes: freeze interface
    - modeless dialogue boxes: request action but can be ignored
  - system-initiated dialogue boxes (modal or modeless)
    - query boxes
    - message boxes; for irreversible operations

Window components--cursors

- Selection pointers
- Text insertion
- System busy & progress indicator

Tasks in windowing systems

- Managing input
  - mouse actions: point, click, press, drag, double click
  - modifier keys
- Changing window focus
  - click to focus
  - mouse focus
- Managing single windows
  - moving, scrolling, resizing
- Managing multiple windows
  - Iconification, tiling, overlapping
  - Where should new windows be placed?

CSCW and windowing systems

- Issues of common workspaces
  - public workspaces
  - private workspaces
  - reflecting state to others (e.g., where one is editing or reading in a document)
  - concurrency control