

## Overview: Graphical User Interfaces and GUI implementation in Java

(Ch. 12-14)

## Graphical User Interfaces (GUIs)

### Graphical User Interface (GUI)

- A visual interface for interaction with human users
- Usually some form of window with various locations for user input/output, or a text-based form (older/simpler systems)

### Widget or Component (in Java)

Nicknames for user interface components used in windows that implement different input/output methods

e.g. a button, a scroll bar, text box, a progress meter

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## GUI: 'Killer App' for Object Oriented Programming

### Class-Based Code Reuse

Intuitive way to implement and deploy customizable widgets, while abstracting common behaviours

- e.g. one class to create simple buttons with a constructor taking a String for the text label (e.g. JButton)

### Widget Structure within a Window

- Often we can cleanly model the composition of widgets and groups of widgets in a window using a tree
- Dot notation is an intuitive way to refer to widgets within the hierarchy, implemented through data member chaining
  - e.g. Window contains two frames, each of which contain 1) a text box and label ("file"), and 2) an image viewer
  - aWindow.frame1.textBox, aWindow.frame2.imageViewer
  - *Note: this form of reference is avoided in Java programs, but hierarchical relationships in data members are present*

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## GUI and OO Programming, Continued

### Widget Attributes

Also represented nicely by object data members, with accessors and mutators to get and set (update) attributes

- e.g. font, font color, width/height, sub-widget layout, geometric constraints, etc.

### A Geometric Note

The origin (0,0) used for computer graphics is at the **top-left corner of the screen**

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## Java and the Swing Library

### Component

Equivalent to "Widget"

### Before Swing: the AWT

Abstract windowing toolkit  
AWT components are mapped to system-dependent components (e.g. 'native' window implementation)  
Relied heavily on underlying systems; error prone

### Swing Library

Reduced (not yet eliminated) system-dependence  
Provides a system-independent "look-and-feel"

### Examples of Swing Widgets

The "swingset" demonstration shows swing components, with source  
Available as part of the jdk, on CS system as the command "swingset"

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