Lecture 12: GUI Builders

UI Construction Techniques

- Procedural
  - writing Java code
- Declarative
  - specifying component hierarchy
  - automatic layout, constraints
  - UIML, SUPPLE
- Direct manipulation
  - GUI builders

GUI Builders
Examples of GUI Builders

- NetBeans
  - Java Swing
- Eclipse Visual Editor
  - Java Swing & SWT
- Visual Studio
  - .NET (for C#, C++, VB)
- Interface Builder
  - Mac OS X
- Qt Designer
  - Qt toolkit (used by KDE)
- Glade
  - GTK (used by Gnome)

Output

- Mostly components
  - Palette of built-in widgets
- To use strokes, you have to write a custom component
- To use static pixel images, pick the image widget (or a JLabel)

Input

- Coding
  - choose events from a menu
  - bring up code editor to write handler
- Making connections by menus & forms
  - Event from a source component (“signal”)
  - Triggers a method or property change on another component (“slot”)
- NetBeans, Qt Designer, Mac Interface Builder all support connections to some extent

Component Hierarchy

- Sometimes visually represented
  - NetBeans, Eclipse VE

- Sometimes implicit
  - Dragging a component into a container’s bounding box makes it a child
  - Bring to Front / Send to Back control sibling order
  - Visual Studio, Qt Designer
Absolute positioning
- usually the default
- gridding for easier alignment
- one-time alignment commands
- Mac IB: "Align to Aqua guides"

Layout managers
- Pick the layout manager
- Use property editor to configure it, or (sometimes) drag & drop components to snapping locations
- Java GUI builders: also Visual Studio docking (border layout)

Struts & springs
- Component edges are connected to container edges with either struts (fixed-size) or springs (variable-size)
- Mac IB, Visual Studio

Persistent alignment commands (Qt Designer)
- Align horizontally, vertically, grid
- Visible affordances after alignment (can be selected, edited to add padding, deleted)
- "Spacer" components (visible during design, not at runtime)

Snapping (Hudson & Yeatts, NetBeans 5.0)

Java “Beans” convention was designed for GUI builders
- getX(), setX()
- addYListener(), removeYListener()

GUI builder can inspect the methods of a class to create editable property list and event menu

Modes
- Design mode
  - Clicking selects controls
  - Designer affordances are visible (e.g., selection handles)
- Test mode
  - Clicking operates the controls, but no backend (no event handlers)
  - Only user affordances are visible
- Run mode
  - Running the whole program, so backend works too

Storing the UI
- Code generation
  - automatic variable naming
    - label1, jmenuItem2
  - initialization code for property & listener assignments
  - DON'T EDIT HERE (NetBeans) vs. closing the loop (Eclipse VE)
- Serialization
  - UI description is stored in a separate format, loaded and instantiated at runtime (Mac IB, NetBeans XML serialization)