CS324e - Elements of Graphics and Visualization

Java GUIs - Frames and Panels
Intro to Java GUls

• First, a little history
• http://vimeo.com/5810737
• Shown at SIGGRAPH
Vol Libre

• Use of fractal (take a shape, split it into subparts, each subpart is the same general shape as the original) to generate things such as mountains, snowflakes, lightning.

  – We will generate a 3d fractal landscape later in the term
Computer Power

- Carpenter reported it took 20 - 40 minutes of computer time to generate each frame of movie.

- Machine was a VAX-11/780.
  - A mini computer with a speed of about 0.5 MIPS. (millions of instructions per second)

- Ball parking: 2 minutes * 60 sec / minute * 30 frames / sec * 30 minutes / frame =

- 75 days? Seems high. If frame rate were less, say 5 / sec answer is 12.5 days.
Computer Power

- The Vax 0.5 MIPS
- Intel Core 7 (high end) 177,730 MIPS
- ~350,000 times faster
- 12.5 days / 350,000 = about 3 seconds
Loren Carpenter

- Loren was an engineer at Boeing.
- He went to work at the computer division at Lucas Films.
- The computer division was eventually sold to Steve Jobs and evolved into Pixar
- instrumental in writing the software used to render Pixar movies
The Teapot

- Homage to the "Utah Teapot"
- A lot of early work in computer graphics was done at the University of Utah
- Martin Newell, 1975
  - wanted a model of an ordinary object to test graphics engine / program
Java GUIs

• Java has huge library of built in classes
  – The API
• works with files, networking, databases, xml, cryptography, graphics, ...
• AWT (Abstract Windowing Toolkit) and Swing
Sidetrack GUls

- In the beginning, was the command line
As Computer use grew (rapidly) ease of use became an issue

HCI, Human Computer Interaction

GUIs

Xerox Alto from PARC and Xerox Star
  – Macintosh
  – Windows
Back to Java GUIs - AWT

• early 90s, AWT was first attempt to provide ability to have graphics and GUIs in Java

• Approach was to have very little code in Java and instead map to components provided by host machine
  – use a Max button or a Windows button

• Java "Write Once, Run Everywhere"
  – "write once, debug everywhere"
Swing

- Sun and Java developers borrowed IFC (Internet Foundation Classes) from Netscape
- Everything written in Java, so not as platform dependent as AWT
  - still use parts of AWT for GUI programming
First Component

• use JFrame class
  – frames hold things
• main class to do "other stuff"
• creates a frame
• Inheritance sidetrack
  – creating a new data type based on a preexisting data type
  – get all of the existing methods!
  – inheritance in Java
HelloFrame

```java
class HelloFrame extends JFrame {
    public HelloFrame()
    {
        setTitle("Our first Frame");
        setSize(600, 400); // width, height
        setLocation(20, 60); // x, y
        setDefaultCloseOperation(JFrame.EXIT_ON_CLOSE);
    }

    public void start()
    {
        setVisible(true);
    }
}
```

- Graphics Coordinate Systems
JPanel

• Frames holds things
• We will use panels as our canvas to draw (paint stuff)
  – painting metaphor very useful in Java graphics
• panel is like a frame and a canvas
• Panels can hold other things, but can we can also paint on them
HelloPanel

• Initial Version:

class HelloPanel extends JPanel{
    
    public HelloPanel()
    {
        setBackground(Color.Orange);
    }

}
Try Drawing on Panel

• Naïve attempt:
  – get graphics object for panel
  – drawString method
  – x, y are of baseline of String
  – in constructor?
  – in start()?
  – what happens when frame resized?
Swing Rendering

• "Something" generates a paint request
  – such as resizing the frame
• A component, such as the frame will eventually have its paintComponent method called
• The component's children will also have their paintComponent method called
• back to front painting
Override `paintComponent`

- in `HelloPanel`

```java
public void paintComponent(Graphics g) {
    super.paintComponent(g);
    numPaintComponent++;
    g.setFont(new Font("Serif", Font.PLAIN, 40));
    g.drawString("Hook em!!", 20, 50);
    g.drawString("Method called "+ numPaintComponent
                + " times", 50, 100);
}
```

- what happens if don't call `super.paintComponent`?
- what happens when resized?