

# Graphics

3-26-2012

# Opening Discussion

- Minute essay comments:
  - Graphics will always involve Java libraries.
  - Graphics measured in pixels by default. We will see that can change.
  - Teaching back at Trinity.
  - Dealing with the uphill battle.
  - A CS minor does not a professional programmer make.
  - How to go about trying to do something completely new.

# Settings

- There are several things that we can set on the Graphics2D object that are used when we draw things. Here are some:
  - Paint – could be a color, but there are also gradients and textures
  - Stroke – determines how lines are drawn
  - Font – how you want text to appear
  - Transform – AffineTransform allows translate, rotate, scale, or shear

# Less Used Settings

- Composite – how colors combine when you draw over old stuff
- Clip – where your drawings will appear
- Render hints – other things like antialiasing

# More General Drawing

- Graphics2D objects aren't limited to just drawing on components.
- The Image class (and its subtype BufferedImage) will let you get Graphics objects that you can draw to and what you draw will be on the image.
- We'll typically do this even if we are drawing to a component to implement buffering which reduces flicker.

# Loading Images

- The easiest way to load images from disk is using `javax.imageio.ImageIO`.
- This class has read methods that take `File` or `URL` objects.

# Double Buffering

- The “proper” way to write the paint method is to have a `BufferedImage` that you draw to, then draw the image to the provided `Graphics2D` object.
- This is called double buffering and it prevents flicker and can make things run faster.

# Mouse Events

- There are several types of events that relate to the mouse.
  - `MouseClicked`
  - `MouseDragged`
  - `MousePressed`
  - ...
- Listen to one of the publishers on a component.
  - `mouse.clicks`
  - `mouse.moves`
  - `mouse.wheel`



# Key Events

- There are three event types for keys.
  - KeyPressed
  - KeyReleased
  - KeyTyped
- Listen to the keys object in a component to get these.
- Compare the key value in the event to values in the Key object.
  - `if(e.key==Key.A) ...`
  - `if(e.key==Key.Left) ...`

# Animations

- For animations and many other things we want code to happen at regular intervals.
- We can set this up with a `javax.swing.Timer`.
  - `new Timer(delay: Int, ae: ActionListener)`
  - Delay is in milliseconds.
  - `Swing.ActionListener(handler: (ActionEvent) => Unit)`
- The function body will be executed at the desired intervals.

# Writing Transforms

- Last time we mentioned `AffineTransforms`, but didn't see what they can do.
- Let's take some time now to write code that uses an `AffineTransform` in our drawing.

# Minute Essay

- Questions?
- IcP #6 is next class.