CS 106A, Lecture 13
Animation

reading:
Art & Science of Java, Ch. 9
You are here

The River of Java

Graphics Programs

Animation

Events

Memory

HW4: Breakout

You are here
Plan For Today

• Null
• Animation
• Practice: Animated Square
• Practice: Kelp Forest
Plan For Today

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Null

Null is a special variable value that objects can have that means “nothing”. Primitives cannot be null.

If a method returns an object, it can return null to signify “nothing”. (just say return null;)

// may be a GObject, or null if nothing at (x, y)
GObject maybeAnObject = getElementAt(x, y);

Objects have the value null before being initialized.

Scanner myScanner; // initially null
You can check if something is null using == and != even though you usually compare Objects using .equals()

```java
// may be a GObject, or null if nothing at (x, y)
GObject maybeAnObject = getgetElementAt(x, y);
if (maybeAnObject != null) {
  // do something with maybeAnObject
} else {
  // null – nothing at that location
}
```
Null

Calling methods on an object that is null will crash your program!

```c
// may be a GObject, or null if nothing at (x, y)
GObject maybeAnObject = getElementAt(x, y);
if (maybeAnObject != null) {
    int x = maybeAnObject.getX(); // OK
} else {
    int x = maybeAnObject.getX(); // CRASH!
}
```
Null

Calling methods on an object that is **null** will crash your program! (throws a NullPointerException)

```
Thread [main] (Suspended (exception NullPointerException))
```

```
/Library/Java/JavaVirtualMachines/jdk1.8.0_121.jdk/Contents/Home/bin/java (Jul 19, 2017, 1:27:22 AM)
```
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Simple animation

• A Graphics program can be made to animate with a loop such as:

```java
public void run() {
    // create shapes here
    while (condition) {
        update the position of shapes;
        pause(milliseconds);
    }
}
```

• The best number of ms to pause depends on the program.
  – most video games ~= 50 frames/sec = 25ms pause
Simple animation

• Example:

```java
public void run() {
    GOval ball = new GOval(50, 50);
    while (true) {
        ball.move(1,1);
        pause(10);
    }
}
```

• Can use `setLocation` or `move` for animation
  – `setLocation` takes an absolute position (x, y) as parameters
  – `move` takes the change in position (dx, dy) as parameters
Graphical methods

• These methods in graphical objects can be useful for animation:

<table>
<thead>
<tr>
<th>Method</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><code>obj.getX()</code></td>
<td>the left x-coordinate of the shape</td>
</tr>
<tr>
<td><code>obj.getY()</code></td>
<td>the top y-coordinate of the shape</td>
</tr>
<tr>
<td><code>obj.getWidth()</code></td>
<td>number of pixels wide the shape is</td>
</tr>
<tr>
<td><code>obj.getHeight()</code></td>
<td>number of pixels tall the shape is</td>
</tr>
<tr>
<td><code>obj.move(dx, dy);</code></td>
<td>adjusts location by the given amount</td>
</tr>
<tr>
<td><code>obj.setLocation(x, y);</code></td>
<td>change the object's x/y position</td>
</tr>
<tr>
<td><code>obj.setSize(w, h);</code></td>
<td>change the object's width*height size</td>
</tr>
</tbody>
</table>

• The GraphicsProgram itself has these methods, too:

<table>
<thead>
<tr>
<th>Method</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><code>getWidth()</code></td>
<td>number of pixels wide the window is</td>
</tr>
<tr>
<td><code>getHeight()</code></td>
<td>number of pixels tall the window is</td>
</tr>
<tr>
<td><code>setCanvasSize(w, h)</code></td>
<td>change the canvas’s width*height size</td>
</tr>
</tbody>
</table>
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Recap

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Next Time: Interactive Graphics Programs