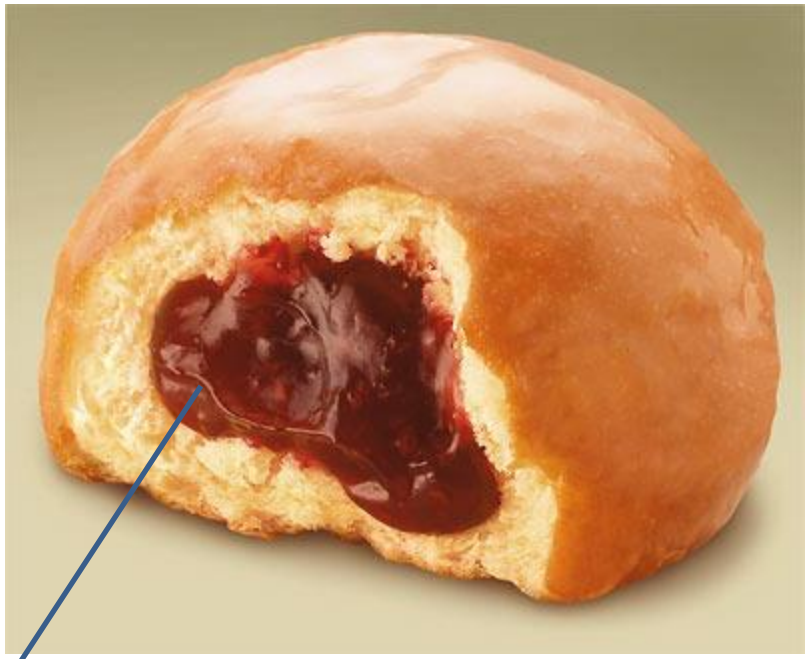
CSSE 220 Day 16

Event Based Programming

Check out *EventBasedProgramming* from SVN

Graphical User Interfaces in Java

- We say what to draw
- Java windowing library:
  - Draws it
  - Gets user input
  - Calls back to us with events
- We handle events



Hmm, donuts

Gooey

Handling Events

- Many kinds of events:
  - Mouse pressed, mouse released, mouse moved, mouse clicked, button clicked, key pressed, menu item selected, …
- We create **event listener objects**
  - that implement the right **interface**
  - that handle the event as we wish
- We **register** our listener with an **event source**
  - Sources: buttons, menu items, graphics area, …

Q1

Using Inner Classes

- Classes can be defined **inside** other classes or methods
- Used for “smallish” helper classes

- Example: `Ellipse2D.Double`

- Often used for `ActionListener`s…

Q2

Anonymous Classes

- Sometimes very small helper classes are only used once
  - This is a job for an anonymous class!

- **Anonymous** → no name
- A special case of inner classes

- Used for the simplest `ActionListener`s…

Inner Classes and Scope

- **Inner classes can access any variables in surrounding scope**

- Caveats:
  - Local variables must be `final`
  - Can only use instance fields of surrounding scope if we're inside an instance method

- Example:
  - Prompt user for what porridge tastes like

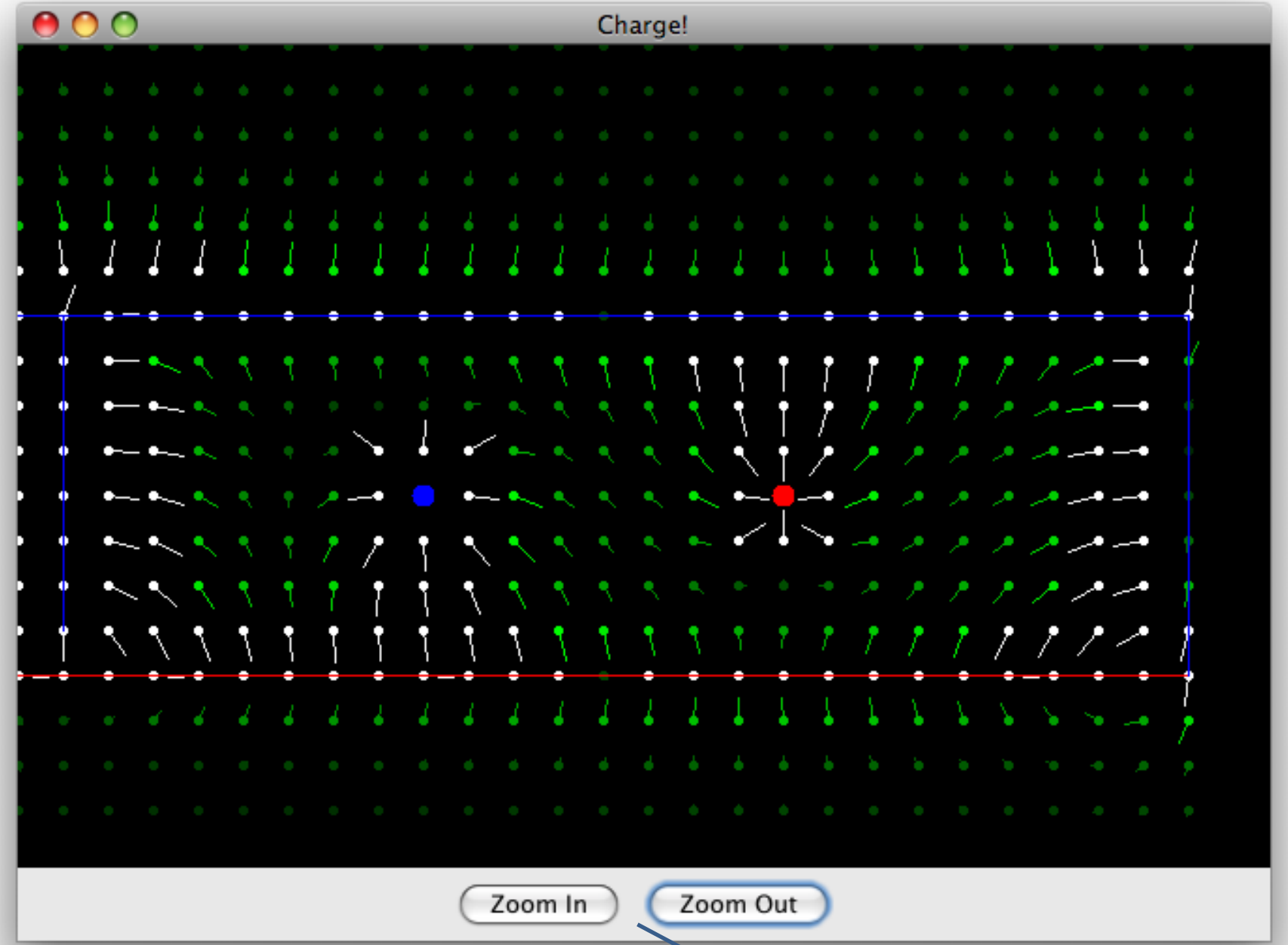
Layout in Java windows

TIME TO MAKE THE BUTTONS

Key Layout Ideas

- JFrame's add(Component c) method
  - Adds a new component to be drawn
  - Throws out the old one!
- JFrame also has method add(Component c, Object constraint)
  - Typical constraints:
    - BorderLayout.NORTH, BorderLayout.CENTER
  - Can add one thing to each "direction", plus center
- JPanel is a container (a thing!) that can display multiple components

Q3-4


Charge!
Zoom In
Zoom Out
So, how do we do this?

Repaint (and thin no more)

- To update graphics:
  - We tell Java library that we need to be redrawn:
    - `space.repaint()`
  - Library calls `paintComponent()` when it's ready

- **Don't call `paintComponent()` yourself! It's just there for Java's call back.**

Q5

Mouse Listeners

```
public interface MouseListener {
   public void mouseClicked(MouseEvent e);
   public void mouseEntered(MouseEvent e);
   public void mouseExited(MouseEvent e);
   public void mousePressed(MouseEvent e);
   public void mouseReleased(MouseEvent e);
}
```

Q6

Work Time

- LinearLightsOut
- Hint: you'll want a class with fields for all the various JButtons in the lights out project. That way after the window is created you can get and set the text of the buttons.