CS1007: Object Oriented Design and Programming in Java

Lecture #11
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Outline

- Review of midterm
  - Please feel free to ask if you don't see something covered.
- On to chapter 5

- Reading: Chapter 5-5.4.1
- Next time: 5.4.2-5.8

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Midterm

- Please see me if you are concerned about your grade..office hours or email me for appointment.
- Some fundamental concepts missing
- Will try to review and will start to address them in the course

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Public/Private classes

- Each .java file must contain one public/abstract class
- But can contain many private classes

- NOTE: if you got the private class marked wrong….please see me, I thought more people were aware of this fact.

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Constructors

- Are called when you instantiate object
- If nothing defined will default to () empty constructor
- Never returns anything
- Can call other constructors IF
  - first line of constructor
- Usage:
  - this(argument list)

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Return values

- Java will in some case make believe there are parenthesis around something

Example:

```
public boolean Something(int a,int b){
  return 5 + a == b;
  }
```

Problem:

```
public boolean Something(int a,int b){
  return 5 + a * 10  == b;
  }
```

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Other issues with code example

- When to cast and when not
  - Explicit vs. implicit
- Can define many methods and not use them at all
  - Might be bad programming
  - Not error

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3 way switch

- Simple class but had to keep track of current state
- Example:
  ThreeWaySwitch A = new ….
- ThreeWaySwitch B = new ..
  A.switch(5);
  B.swtich(1);

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Exception handling

- If you are throwing an exception in the method, you need to make it part of the signature
  - This doesn't apply if it is contained…i.e. within and handled by try/catch block.
- Finally clause always handled (unless you kill the program).
  - Many people didn't understand the order of this.

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Inheritance / Exception

- Order of catching exceptions important
  - More general should always be caught last
  - Else will have unreachable code.

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Course plan – After Midterm

- Take home lesson: this is a chance to make sure you are on track….please see me with any concerns
- Will balance Object oriented design (correct way) with fundamentals (what you can use).
  i.e not just how to use a hammer correctly but also what kinds of hammers are available.

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Patterns

- Many times when programming large projects:
  - Notice certain underlying patterns
  - Example: email file

    many different ways of representing email messages

    but: end user will want to treat them the same way!
  - Haha! A pattern

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Iterator Pattern

- Covered before midterm
- Collection of elements
- Users want to examine elements
- We don't want to expose the underlying implementation
- Ability to allow multiple independent access

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Iterators pattern

- Define a general iterator that fetches one element at a time
- Each iterator object keeps track of the position of the next element
- If there are several collection/iterator variations, it is best if the collection and Iterator classes realize common interface types.

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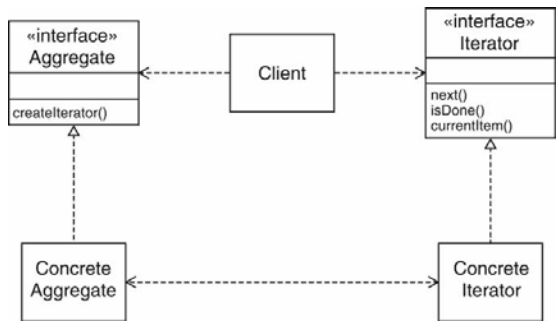

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GUI programming

- Strong graphical component in java language.
- Very easy to create graphics and graphical components
- Because it is based on an Object Oriented Approach
- Again pattern based programming

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Observer Patterns

- In many applications will have multiple views of the same data
- When you edit one part, affects other parts of the view
- Eclipse

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Division of Labor

- Model: data structure, no visual representation
- Views: visual representations
- Controllers: user interaction

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- Views/controllers update model
- Model tells views that data has changed
- Views redraw themselves

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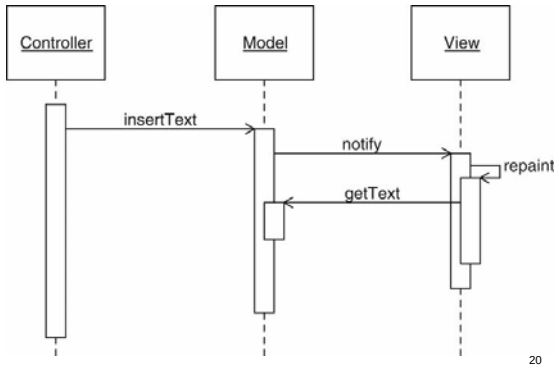

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Observer Pattern II

- Model notifies views when something interesting happens
- Button notifies action listeners when something interesting happens
- Views attach themselves to model in order to be notified
- Action listeners attach themselves to button in order to be notified
- Generalize: Observers attach themselves to subject

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Consider

1. An object, called the subject, is source of events
2. One or more observer objects want to be notified when such an event occurs.

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Idea

- Define an observer interface type. All concrete observers implement it.
- The subject maintains a collection of observers.
- The subject supplies methods for attaching and detaching observers.
- Whenever an event occurs, the subject notifies all observers.

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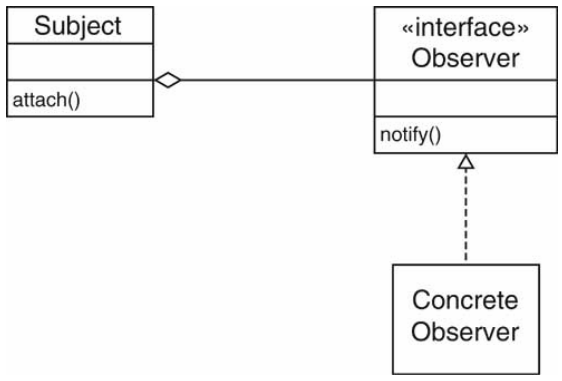

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Layout Managers

- Set layout manager

```
JPanel keyPanel = new JPanel();
keyPanel.setLayout(new GridLayout(4, 3));
```

- Add components

```
for (int i = 0; i < 12; i++)
    keyPanel.add(button[i]);
```

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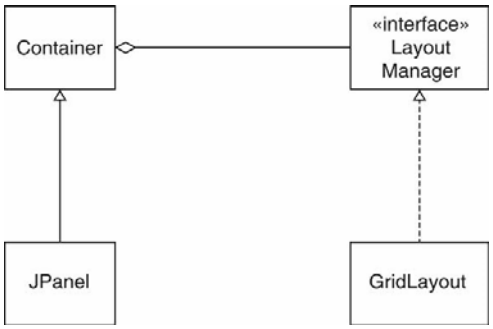

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GUI for Voicemail system

- Same backend as text-based system
- Only Telephone class changes
- Buttons for keypad
- Text areas for microphone, speaker

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Keys

- Arrange keys in panel with GridLayout:

```
JPanel keyPanel = new JPanel();
keyPanel.setLayout(new GridLayout(4, 3));
for (int i = 0; i < 12; i++)
{
   JButton keyButton = new JButton(...);
   keyPanel.add(keyButton);
   keyButton.addActionListener(...);
}
```

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- Panel with `BorderLayout` for speaker

```
JPanel speakerPanel = new JPanel();
speakerPanel.setLayout(new BorderLayout());
speakerPanel.add(new JLabel("Speaker:"),
  BorderLayout.NORTH);
speakerField = new JTextArea(10, 25);
speakerPanel.add(speakerField,
  BorderLayout.CENTER);
```

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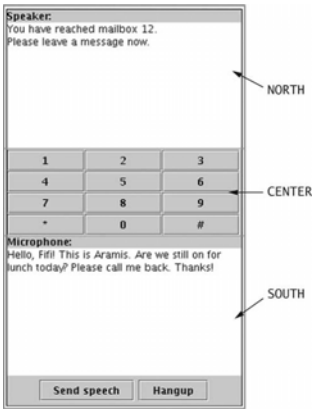

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- Ch5/code/mailgui/Telephone.java.html

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Custom Layouts

- Form layout
- Odd-numbered components right aligned
- Even-numbered components left aligned
- Implement `LayoutManager` interface type

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LayoutManager Interface

```
public interface LayoutManager
{
   void layoutContainer(Container parent);
   Dimension minimumLayoutSize(Container parent);
   Dimension preferredLayoutSize(Container parent);
   void addLayoutComponent(String name, Component
  comp);
   void removeLayoutComponent(Component comp);
}
```

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Form Layout

- Ch5/layout/FormLayout.java
- Ch5/layout/FormLayoutTester.java
- Note: Can use GridBagLayout to achieve the same effect

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Plan

- Pluggable strategy for layout management
- Layout manager object responsible for executing concrete strategy
- Generalizes to Strategy Design Pattern
- Other manifestation: Comparators

```
Comparator<Country> comp = new CountryComparatorByName();
Collections.sort(countries, comp);
```

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Objective

1. A class can benefit from different variants for an algorithm
2. Clients sometimes want to replace standard algorithms with custom versions

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Solution

- Define an interface type that is an abstraction for the algorithm
- Actual strategy classes realize this interface type.
- Clients can supply strategy objects
- Whenever the algorithm needs to be executed, the context class calls the appropriate methods of the strategy object

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In short

- PLUG AND PRAY

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Next Time

- Do Reading (through 5.8)
- Review midterm to make sure you understand what went wrong.

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