Object-Oriented Design VectorGraphics

CSSE 221

Fundamentals of Software Development Honors

Rose-Hulman Institute of Technology

ROSE-HULMAN INSTITUTE OF TECHNOLOGY

Announcements

- Capsules round 1 returned
  - Again, great work researching!
- Start capsules round 2 next weekend
- Exam 1 is Wednesday and Friday in class

Exam 1

Sample posted on Moodle

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Any Questions on Exam 1?

- Venue:
  - Section 1: Olin Hall, room 257/231
  - Section 2: Olin Hall, room 167
- What questions do you have?

A team project to create a scalable graphics program.

Vector Graphics Assignment

http://www.rose-hulman.edu/class/csse/binaries/VideoDemos/VectorGraphics220.mov

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Work time today

- Now:
  - Read the specification
  - Sketch out some screen layouts
- Design (CRC cards, UML, User stories) due Monday (Oct 7)
- Code due Tuesday (Oct 15)
- In ~15 minutes
  - How to create CRC cards
  - Review of UML

A practical technique

Object-Oriented Design

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Object-Oriented Design

- We won't use full-scale, formal methodologies
  - Those are in later SE courses
- CRC cards → UML class diagram
- Like any design technique, the key to success is practice

Key Steps in Our Design Process

1. **Discover classes** based on requirements
   - Come from **nouns** in the problem description
2. **Determine responsibilities** of each class
   - Come from **verbs** associated with the classes
3. **Describe relationships** between classes:

   is-a, has-a

May...

Represent single concepts

`Circle, BigRational`

Represent visual elements of the project

`ColoredPanel`, `GameButton`

Be abstractions of real-life entities

`BankAccount`, `TicTacToeBoard`

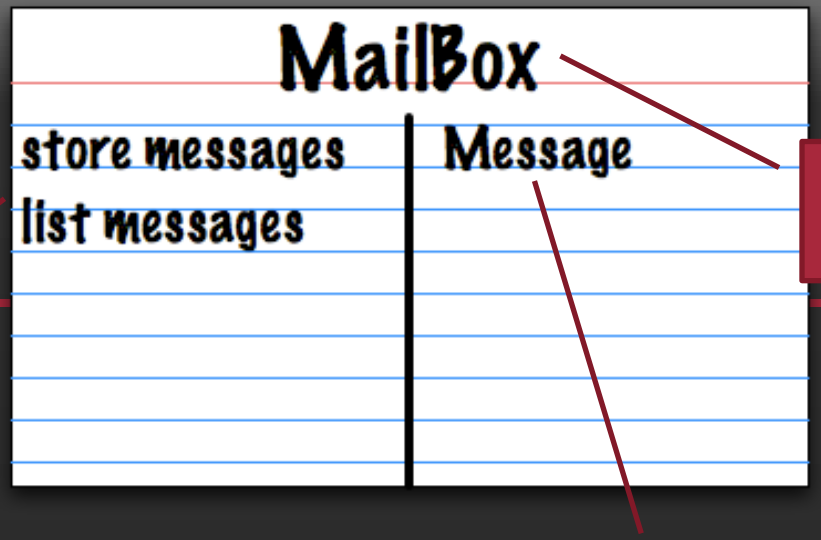
Be actors

`Scanner`

Be utilities

`Math`

CRC Card Technique



1. Pick a responsibility of the program
2. Pick a class to carry out that responsibility
   - Add that responsibility to the class's card
3. Can that class carry out the responsibility by itself?
   - Yes → Return to step 1
   - No →
     - Decide which classes should help
     - List them as collaborators on the first card
     - Add additional responsibilities to the collaborators' cards

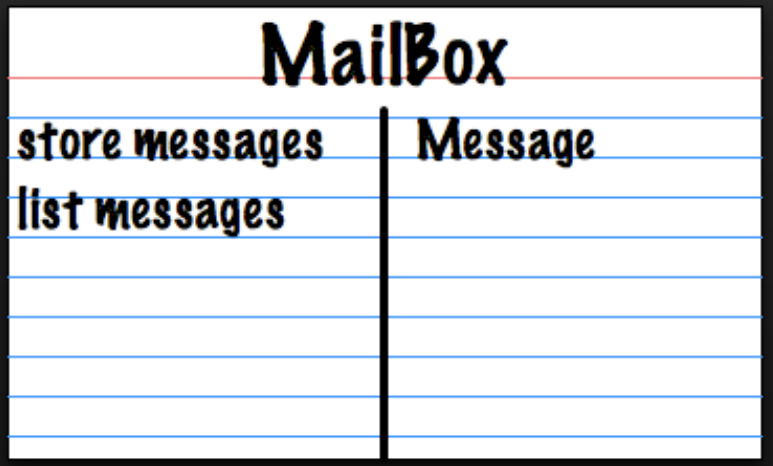
CRC Card Tips

- **Spread the cards out** on a table
  - Or sticky notes on a whiteboard instead of cards
- **Use a "token"** to keep your place
  - A quarter or a magnet
- **Focus on high-level responsibilities**
  - Some say <= 3 per card
- **Keep it informal**
  - Rewrite cards if they get to sloppy
  - Tear up mistakes
  - Shuffle cards around to keep "friends" together

Make CRC cards for your VectorGraphics project

1. Pick a responsibility of the program
2. Pick a class to carry out that responsibility
   - Add that responsibility to the class's card
3. Can that class carry out the responsibility by itself?
   - Yes → Return to step 1
   - No →
     - Decide which classes should help
     - List them as collaborators on the first card
     - Add additional responsibilities to the collaborators' cards

- High cohesion
- Low coupling
- Immutable where practical
  - Document where not
- Inheritance for code reuse
- Interfaces to allow others to interact with your code



Convert your CRC Cards to a UML class diagram

- Classes stay classes
- Responsibilities become properties (methods)
- If attributes (fields) are obvious, add them
  - Who stores the list of shapes?
- Collaborators are usually has-a relationships
- If is-a relationships are obvious, add them

Summary of UML Class Diagram Arrows