CS1007: Object Oriented Design and Programming in Java

Lecture #1

Jan 17

Shlomo Hershkop
shlomo@cs.columbia.edu

1

Welcome

- Today:
  - Basic overview of the course and objectives
- Goal:
  - Thing are much easier if everyone knows why they are here, and what we are trying to accomplish.
  - I will not stand here an lecture (although there will be some of that). This is going to be a very interactive course.
  - We will learn about programming ideas while trying to have fun.
  - I hope to impart an impression of why I choose to study CS and some of the options available to you.

2

What?

- CS1007: Second course for CS majors.
- Prerequisites:
  - Basic knowledge in Java Programming
- NOTE: JAVA is only a tool!!
- Advanced Java
- Object Oriented Programming:
  - What, why, how, and when.
- Program Designs.
  - Not enough to know how to write the program, need to know how to do it correctly.

3

Example:

- Task:
  - Create a program to run a chess game set.
  - Anyone can learn how to program and throw together a game

4

Computer *Science*

- What are the components of the system?
- How to design the programming backend?
- Ideas on how to measure requirements.
- What else is missing?

5

CS1004 vs CS1007

- CS1004 is an Introduction for those with no formal CS/Java training
  - Assumes only basic computer skills (email, web, mouse, brain)
  - Focuses on basic theoretical knowledge as well as basic Java fluency
- CS1007 assumes basic Java knowledge
  - If you don't know Java and/or didn't take the AP CS exam, you're in the wrong room.
  - Emphasis on more advanced Java and algorithmic skills.
- If you have questions, ask me after class

6

Basics

- Instructor: Professor Shlomo Hershkop
  - (shlomo@cs.columbia.edu)
  - 460 CSB
  - Research background
- Class website:
  - cs.columbia.edu/~sh553/teaching/1007s06/
  - Check it regularly (at least twice a week).
    - See announcement sections for update info.
- Two lectures a week.
- Check website for office hours

7

Resources

- TA's:
  - Ohan Oda
  - Stanley Tzeng
- Courseworks
  - Grading
  - Announcements
  - Class Web board
    - Excellent place to post GENERAL questions, and solutions.
      - Good: How do I check what version of java is running?
      - Bad: What is wrong with my code:
        public class foo()

8

Requirements

- Interest to learn about OOP
- Textbook:
  - Basic Java Intro
    - John Lewis and William Loftus - Java Software Solutions: Foundations of Program Design
    - Horstmann - Big Java
  - **Cay S. Horstmann**
    OO Design & Patterns, 2nd ed.
    ISBN 0-471-74487-5
  - Textbook can be acquired online or at the Columbia Bookstore.

9

Why this textbook

- Light
- Well written
- Covers the subject well
  - Good mix of theory and practice
- Interesting Examples

10

Course Structure

- 6 Homeworks – 150 points (50% of grade)
  - Will have about 2 weeks per homework
- Midterm (50 points), Final (100 points)
  - open book
- Homework is very important:
  - Firm believer in hands on learning
  - Start early
  - Come to office hours, and ask questions
    - We are here for YOU!

11

Homework Assignments

- Written Sections:
  - Will be collected at first class after HW deadline.
- Programming:
  - Online submission
  - Must be able to run on cunix system (this is important).
- Late policy:
  - You have 3 late days that can be used during the semester.
  - Late day is exactly 24 hours.
  - After your late day deadline passes, the homework will not be accepted.
- Extra Credit:
  - To allow for some maneuvering room, there will be extra credit assignments during the semester.

12

Class participation and Attendance

- Attendance and participation is expected
  - Very interactive lectures
  - I hope to learn everyone's name by midterm
  - Useful for your grade
  - Anonymous feedback system
- If you have to miss class, I expect you to catch up.
  - There will be some type of class notes posted to the website (After class).
  - There will be many examples in class on the board, so make sure to get someone's notes.

13

Cheating Policy

- Don't

14

Cheating Policy

- Plagiarism and cheating:
  - I'm all against it. It is unacceptable.
- You're expected to do homeworks by yourself
  - This is a learning experience.
  - You will only cheat yourself.
  - My job is to help you learn, not catch you cheating, but….
- Automated tools to catch plagiarizers
  - http://www.cs.berkeley.edu/~aiken/moss.html
  - Moving stuff around, renaming, etc. doesn't help
- Results: instant zero on assignment, referral to academic committee
  - Columbia takes dishonesty very seriously
  - I'd much rather you come to me or the TAs for help

15

Shopping List

- Recommend you have an extended CUNIX account.
  - Try to log into the cunix account
- Check out the class page
- Obtain a textbook
- See Homework 0 on class page
  - A basic assignment to get you started…no credit.

16

Next Up

- Hopefully you all remember your basic java
- Will cover some of the basics, and will start advanced topics next class.

17

Java Language

- A *programming language* specifies the words and symbols that we can use to write a program
- A programming language employs a set of rules that dictate how the words and symbols can be put together to form valid *program statements*
- The Java programming language was created by Sun Microsystems, Inc. and introduced in 1995.

18

Language Levels

- There are four programming language levels:
  - machine language
  - assembly language
  - high-level language
  - fourth-generation language
- Each type of CPU has its own specific *machine language*
- The other levels were created to make it easier for a human being to read and write programs

19

Programming Languages

- Each type of CPU executes only a particular *machine language*
- A program must be translated into machine language before it can be executed
- A *compiler* is a software tool which translates *source code* into a specific target language
- Often, that target language is the machine language for a particular CPU type
- The Java approach is somewhat different

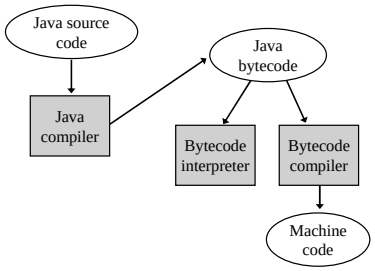
20

Java Translation

- The Java **compiler** translates Java source code into a special representation called *bytecode*
- Java bytecode is not the machine language for any traditional CPU
- Another software tool, called an ***interpreter***, translates bytecode into machine language and executes it
- Therefore the Java compiler is not tied to any particular machine
- Java is considered to be *architecture-neutral*

21

Java Translation



22

Sample program

```
import java.lang.String;

public class Test{

  public static void main(String
  args[]) {

  System.out.println(“Hello World”);

}
```

23

process

- Environment:
  - Emacs at the beginning of the course
  - Eclipse (or equivalent) later on.
- Compile using :
  - javac Test.java
- Execute:
  - java Test

24

Executing

- The class file you pass to the java program needs to have a main method.
- If no main method present will see the following error:

```
Exception in thread "main"
  java.lang.NoSuchMethodError: main
```

25

Errors

- Pay attention to run time errors
  - What class involved
  - What line (debuggers)
  - What method involved
  - Sequence trace

26

API Documents

- Unlike other languages, java has many libraries bundled by default
- Application Programming Interface (API) docs, are the view given to the programmer
- Please don't reinvent the wheel if it exists already (unless specified).

  Example:

  java.lang.String
  java.util.StringTokenizer

27

Topics to be covered

- Review of Java basics, Introduction to object oriented programming, Writing classes in Java.
- Extended Java coverage: Exception handing. Event Handling. Applets. GUIs. Java I/O
- Object Oriented concepts: Abstraction, Polymorphism, Inheritance
- Problem solving, program design, and common Design Patterns
- Algorithms and Algorithm Analysis: Searching and Sorting
- Introduction to data structures: Queues, Binary trees, etc.
- Problem solving with Recursion
- Advanced topics: multi-threading, concurrency, network programming.

28

Next class:

- Cunix overview
- Review of Java basics.
- Advanced Topics
  - API and some built in objects
- Simple Exception handling.

29

Feedback System

- Last minute of class will be set aside for feedback:
  - Please bring some sort of scrap paper to class to provide feedback.
  - Feel free to leave it anonymous.
  - Content: Questions, comments, ideas, random thoughts.
- I will address any relevant comments at the beginning of each class.

30

Today's Feedback

1. Class: CC, GEAS…
2. Year planning to graduate:
3. Computer background
4. Familiar with unix/linux/windows command prompt?
5. Will you be mostly using your own computer or lab?
6. Have you used a debugger, which.
7. Why are you taking this course, and what are you planning on doing long term.
8. Which intro book do you have
9. Any comments

31