GEOG 178/258: Conceptual Modeling and Programming for the Geo-Sciences

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Week 10: Review and Q&A
Review (IDE)

- How to use Eclipse (IDE) for programming:
  - Create new projects;
  - Load projects;
  - Debug (perspective): create break points, watch expression, inspect variables;
  - Comments/ documentation;
  - Create classes;
  - Build UML from existing classes;
  - Build path to external libraries
  - ...

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Winter 2016
Review (Java Basics)

• Java Basics

*Operators*: +=, -=, i++, ++i, <, <=, &&, || ...

*Control statements*:
- Loops: while-loop, for-loop, for-each-loop
  ("break" to jump out of loop)
- Selection: if-else, swich, max=(a>b) ? a: b
Review (Concepts)

- Methods, variables and their visibility

**Methods:**
- Modifiers, return type, method's name, parameters, exceptions and body.
- Call-by-reference and call-by-value

**Variables:**
- Type, name and value
- Type: primitive data types
- Casting: automatic and manual
Review (Concepts)

- Methods, variables and their visibility

**Visibility:**
- public, private, protected and no declaration
- two more key words: static and final
Review (Concepts)

• Classes and objects

Class:
  – Member variable, getters and setters, constructor, specific methods
  – Member variables are usually protected!

Object:
  – behavior and states
  – Waterbody aWb=new Waterbody(50);
Review (Concepts)

• Inheritance
  − Hierarchical classification: subclass and superclass
  − Generalized access to public methods and variables
  − Keywords: extends and super
  − Difference between inheritance and delegation: Polyline is not a kind of Point but a Polyline is a specific kind of Geometry.
Review (Concepts)

• Interface
  - Interface only specifies *signature* of methods, class *implements* the interface by implementing all methods.
  - Only declaring rather than implementing them
  - Geometry {computeArea(), dimensionality()}... for Point, Polyline and Polygon
Review (Software Pattern)

• Model-view-controller (MVC)
  - What parts are model, view and controller respectively in your applications?
Review (IO)

• Java I/O
  - How to read in image (BufferImage)
  - How to read in texts (Bufferreader)
  - How to read in URL (URL)

• Exception handling
  - try-catch-final
  - throw(s)
Review (GUI)

- Graphical user interfaces (GUI)
  - Components
  - Events and Listener
Review (Others)

- Other topics:
  - Complexity
    - Linear search
    - Binary search
    - Spatial search
  - Serialization
Review (Data Structures)

- Data structures
  - Arrays:
    - collections of the same type;
    - `int[] tuple = new int[2];`
    - starts at 0
  - ArrayList:
    - a list implementation based on arrays;
    - `ArrayList<Building> b = new ArrayList<Building>();`
    - no limitation for the size, add(), get(index);
    - iterator(): hasNext(), next().
  - LinkedList:
    - fast and frequent insertion and removal of element
  - Stack, queue, hashmap, set ...
Review (Libraries)

• Libraries you learned:
  Math (System library);
  java.util.ArrayList
  java.util.Arrays
  java.util.List
  java.util.Iterator
  java.awt
  javax.swing
  java.net
  java.io
  javax.imageio
  CSVReader
  ...
Review (Practices)

• Practical examples/applications

**Geographic classes:** Point, Polyline, Polygon (OGC simple features)
  → euclidean distances, bounding box, disaster evacuation model;

**Geostatistics:** Poisson probability;

**GUI:** Buffer Snap, Affine transformation, Digitizing, POI;

**Advanced:** LightBulbs, Tran Game, remote sensing re-classification, invert and clip raster;

...
Thank you very much!
Good Luck!

Q&A!