

Programming Assignments #4 and 5

CS 202 Programming Systems

For This Program

With both programs #4 and #5 you will be implementing your solutions using Java. Your goal must be to develop an object-oriented solution but this time implement it in Java. Make sure that your OO Design is not centered around your data structures – your data structures support the design but shouldn't be the primary emphasis of your design. You may use Eclipse or IntelliJ to develop your software. Your Java programs must follow these rules:

- **No public or friendly fields (data members) *** NONE!!!*****
- No friendly methods (member functions)
- Yes, you SHOULD use the string class!
- Limit your use of static methods – these should be restricted to just utility functions and main
- Use an inheritance hierarchy using “extends”; there must be a minimum of 5 classes with 3 of them in a hierarchy. *These should not be isolated to just your data structures.*
- The application that USES the hierarchy must be in a class on its own. Or, it could be part of a hierarchy, so think about that.
- Create at least one abstract base class
- Implement at least one constructor with arguments
- Implement at least two functions using function overloading between classes and experiment with the way function overloading works in Java. ****Write about this.*
- Implement dynamic binding and experiment with how it works in Java. Prove to yourself that the functions are being overridden versus overloaded. ****Write about this*
- Try out the super keyword in invoking a base class' constructor. *This is what we use instead of an initialization list. ***Write about this in your*

For each of the above that you experiment with, write up information about it in your efficiency write-up

You are required to turn in a paper on how this solution is object oriented (your design). There is ONLY ONE design writeup for the combined programs 4-5. But, with EACH program, you are required to write 400 words about the efficiency and IDE (rather than the debugger).

Data Structures

In these last two programs, you must implement two data structures:

1. Program 4: A tree of trees (e.g., *each node in the outer tree has a root pointer to another tree*)
 - a. If you have already implemented a balanced tree in a previous assignment: A Binary Search tree, implementing insert, display, retrieve, retrieve all related items, remove an individual item, and remove all; the algorithms must be implemented recursively.
 - b. If you have not yet implemented a balanced tree, then:
A balanced tree, implementing insert, display, retrieve, retrieve all related items and remove_all (no remove individual items).
2. Program 5: A doubly linked list of arrays

The required data structures specified in the assignment must be your own implementation: as in BSTs (or balanced tree) and doubly linked lists. Once you meet the basic requirements of the assignment, you are allowed to use libraries for any subsequent data structures.

Program Requirements

I am about to journey to Changchun, China again to perform proficiency demos at CCUT. I greatly enjoyed my trip over Spring break last year and am looking forward to another fantastic journey this year. But, I was looking around at lodging opportunities and came across a great website: airbnb.com. Using this site you can rent out complete apartments by the night or rent out rooms (like a “bed and breakfast”). Staying at a “bed and breakfast” (bnb) seems like a fabulous way to travel with limited expense.

Your job is to create a program of what will ultimately be an App to assist people in finding places to stay. Before the program can be used, we need users volunteer to rent out all or part of their home, creating the data set. This will be the first step with Program #4. Then, once the data exists, with Program #5 we can have users (like me) look up places to rent for a certain amount of time (Program #5).

Start by looking up how to use airbnb.com, and get an idea of what information it contains. Here is a brief list of what I came up with: Location (city, state/region, country), Type of lodging (1 room, apartment, house, etc.), Price per night, Availability (are there “black out” dates when it isn’t available – maybe the home owner wants to stay there for the month of August), Number of guests (allowed), Review from previous tenants (keep this in a data structure of the reviews).

Here are some suggestions on where to use the data structures assigned. These are JUST suggestions; you may adjust how the data structures are used:

1. Program #4 - A tree of cities (or regions) supported by our airbnb program, where each node is a tree of the bed and breakfast (bnb) places in that city or region available to rent.
2. Program #5 - A doubly linked list of all of the cities (or regions) that we will be traveling to and an array of the bed and breakfast (bnb) places where we plan to stay in that region.

Your job is to come up with a design of an OO framework that will support an airbnb type of application; you are not required to work with calendars or actually make the reservations. Although you all have the ability to write this using procedural abstraction, the key is to make sure to solve this problem using Object Oriented methodologies **with dynamic binding** and function overloading. *The use of external data file(s) are necessary!*