CMSC 132

Sections 020X/030X

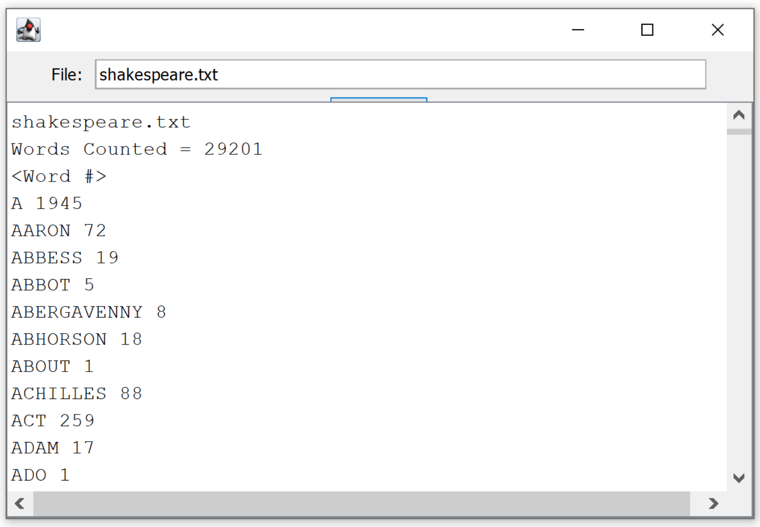
DEPARTMENT OF COMPUTER SCIENCE

Assignment: **Project #6**

Due Date: **Thurs 04/14, 11:00PM**

Open/Closed policy: **CLOSED**

Binary Search Tree Map



```
shakespeare.txt
Words Counted = 29201
<Word #>
A 1945
AARON 72
ABBESS 19
ABBOT 5
ABERGAVENNY 8
ABHORSON 18
ABOUT 1
ACHILLES 88
ACT 259
ADAM 17
ADO 1
```

Overview

The objective of this project is to implement a polymorphic binary search tree. This project is designed to help you develop your skills at recursion, polymorphism and testing.

Begin by downloading the project zip file and importing it into Eclipse.

You will implement the methods of the EmptyTree and NonEmptyTree classes. We have provided a Tree interface and a partial implementation of the SearchTreeMap class (you must implement the keyList and subMap methods). Complete documentation for these classes can be found at javadoc documentation.

Grading

- (90%) Automated Tests
  - (10%) Public JUnit tests
  - (48%) Release JUnit tests
  - (32%) Secret JUnit tests
- (10%) Style

Testing

As always, you are expected to develop test cases that test your code. You only get a few test cases in the class PublicTests, and the release tests all have unhelpful names such as testOne and testTwo.

In addition to the release tests, there are additional secret test cases. Don't assume that just because your implementation passes the release tests, it is correct.

The WordCountGUI is not really part of this assignment, but it has been provided for fun. This program uses a SearchTreeMap to count the number of times each word appears in the text file specified by the user. You may use the program to gauge how well your SearchTreeMap implemention works. The default file is a text file containing the complete works of Shakespeare (give it a few seconds to load after pressing the button!) Of course you may enter any file name you wish into the box. (We have also included "beatles.txt" and "lincoln.txt"

Design

The SearchTreeMap class implements some of the functionality of the Map interface (although not all). A SearchTreeMap object is just a wrapper around a Tree.

Note that the insert and delete methods on Tree objects return references to Tree objects. In many cases, these functions may return a reference to the **this** object. However, in some cases they can't. For example. EmptyTree.getInstance.insert("a", "1") has to return an instance of an NonEmptyTree object.

Restrictions

- **You may not use any form of looping construct anywhere in this project. If you do, your grade on the entire project will be 0. No for-loops, no while-loops, no do-while-loops, no for-each-loops!**
- You may not use any arrays.
- You may not use any sorting algorithm anywhere at any time.
- You may not explicitly check a Tree to see whether it is an EmptyTree or NonEmptyTree.
- Your EmptyTree and NonEmptyTree implementations may not have any comparisons against the null value.
- You should not need to do any casting for this project. If you are casting then you are probably not using generic programming correctly.
- If you insert multiple values with the same key, only the value associated with the most recent put( ) will be saved in the map.
- You may not use any classes from java.util except ArrayList and only to implement the keyList( ) method.
- You may not check whether a tree is empty by using comparisons similar to the following:
  - left==EmptyTree.getInstance()
  - tree.size() == 0
  - size() == 1
  - Other comparisons similar to the above

  You are expected to use polymorphism (and exception handling, where appropriate) to handle the differences between empty and nonempty trees. Failure to do so will result in a large negative adjustment to your project grade.

- You may not use instanceof.
- You may not use getClass().
- The delete method must use the approach described in the lecture slides, or something equally efficient. You may not implement delete by creating a new tree and inserting all the keys from the source tree except the one you want to delete.
- For the Subtree method you may not start with an Empty Tree and then traverse the whole tree inserting only those entries that are within the specified range. If a simple check will tell you that an entire subtree can be excluded, your implementation should not traverse that subtree.

The above restrictions do not apply to your test cases; you may write them however you wish.

Suggestions on How to Start/Implement This Programming Assignment

- Understand how a traditional (non-polymorphic) tree works.
- Check the polymorphic list implementation we discussed in lecture.

Web Accessibility