

Report for Assignment 1  
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I am using the nested class here in the Java programming language. The outer class I have is called avltree, and the inner class is called AVLNode. Therefore, the AVLNode is included in the avltree. I also make the AVLNode class as static.

How to run the program:

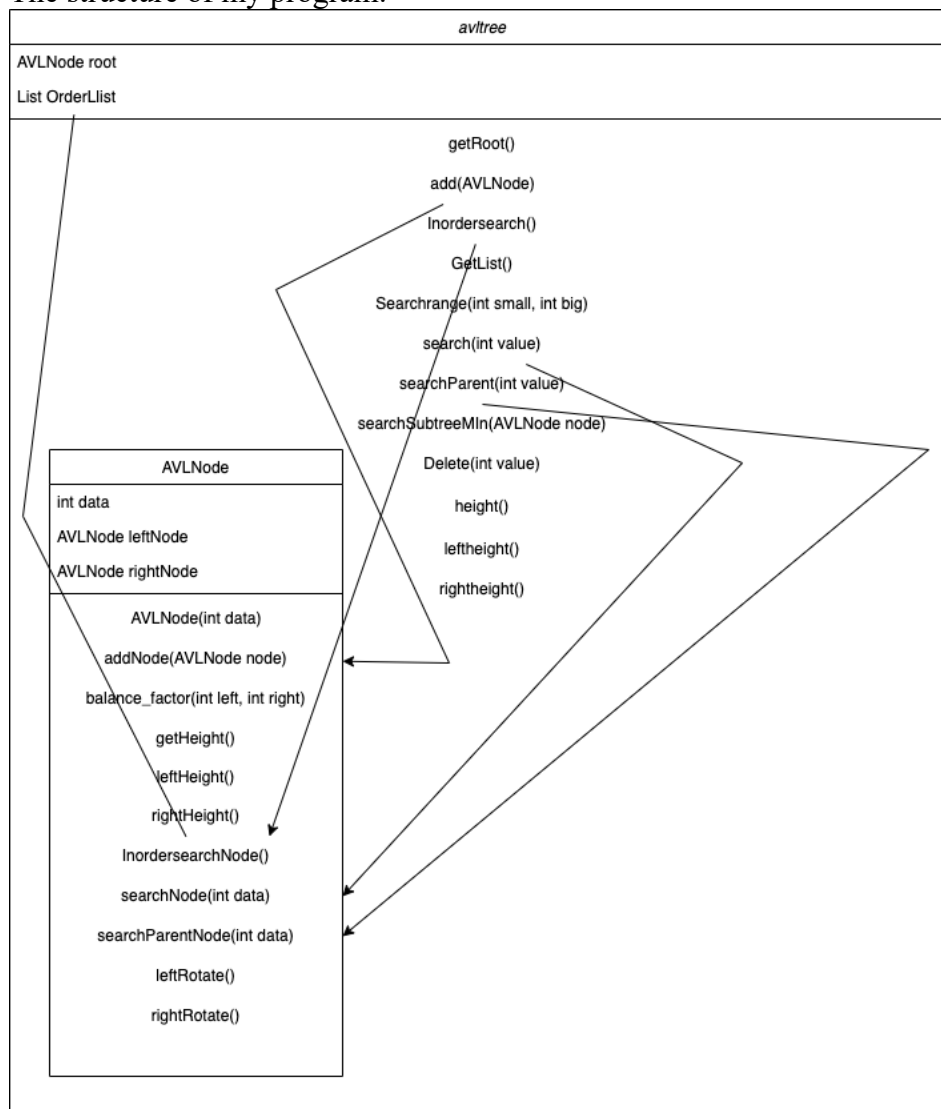
1. Unzip the file
2. Type make
3. Type java avltree filename

I already included my test file called Inputfile.txt in the zip. And, the tested output is in the output\_file.txt.

Packages:

```
import java.util.*;  
import java.io.File;  
import java.io.FileNotFoundException;  
import java.io.FileWriter;  
import java.io.IOException;
```

The structure of my program:



Explanation:

The avltree class has two attributes. I set the root of avltree as private. I also get the method to help get the root of the tree called get\_Root(). I have the integer type List called OrderList. I set it as static because it needs to be accessible for each instance of AVLNode. This OrderList is used to store the number on the AVL tree in the ascending order. This supports the Search() for two parameters. Next, the inner class, AVLNode has three attributes. The leftNode, rightNode and data. The leftNode will reference to the left node of the target node, the rightNode will reference to the right node of the target node. The data stores the integer value of the node.

First, we look at the function add(AVLNode node) in the outer class, it will check whether the root is null. If the root is null, we just make the node as the root. Otherwise, we will call the addNode function which is declared in the AVLNode class in terms of the root in the avlTree class.

Second, the function Inordersearch(), this function helps to the in order traversal of the AVL tree. Once the Inordersearch() is called, this will trigger the InordersearchNode() in the AVLNode class. The InordersearchNode() will follow the logic of in order traversal.

Third, the Searchrange(int small, int big) method will perform the search between two numbers and return the list of them in the ascending order. It will depend on the constructed OrderList after performed the InordersearchNode().

Forth, we have the search(int value) function. If it is a null tree, it will return null. Then, it will trigger the searchNode(int data). And, the rest of the process will stay in the searchNode(int data). The leftNode and rightNode lead the direction to go left or right of serarchNode(int data). The searchNode(int data) is always one function I need to use in Delete(int value).

Fifth, we have searchParent(int value) in the avltree class. If it is a null tree, it will return null. Then, it will trigger the searchParentNode(int data) in the AVLNode class. It helps the Delete(int value) in the following to find the parent node.

Sixth, searchSubtreeMin(AVLNode node) is used to find the min value on the subtree and all the methods contains height in both classes are used to check the height of the AVL tree. It supports the calculation of balance factor for indication of rotation. And, by printing out the height, I can check if I am implementing the correct AVL tree.

Seventh, the Delete(int value) is used to do the deletion of AVL tree. The leftRotate() and rigthRotate() are both used in the Delete(int value) and the addNode(AVLNode node) in the AVLNode class.

Finally, the rest of code is all about reading and writing files. And, some functions before main are the two that I used to get the command and key value inside the ().