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CMPS 390 – Program 6 Tree Vs Bubble

This program reads the file of integers, and stores them in an array pre-sorted. A method called buildSort sorts puts them in order in a tree. A method called inOrder prints them out from low to high. A method called compareTotal counts the number of comparisons.

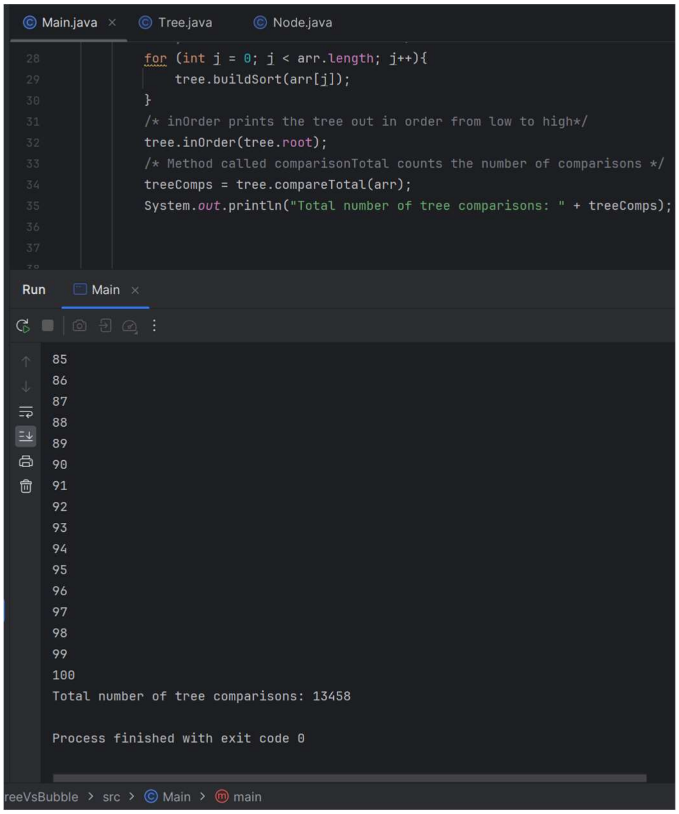
Total number of tree comparisons: 13458

Total number of bubble sort comparisons are: 953046

The tree sort program is more efficient

Based on comparisons made, the tree sort is more efficient

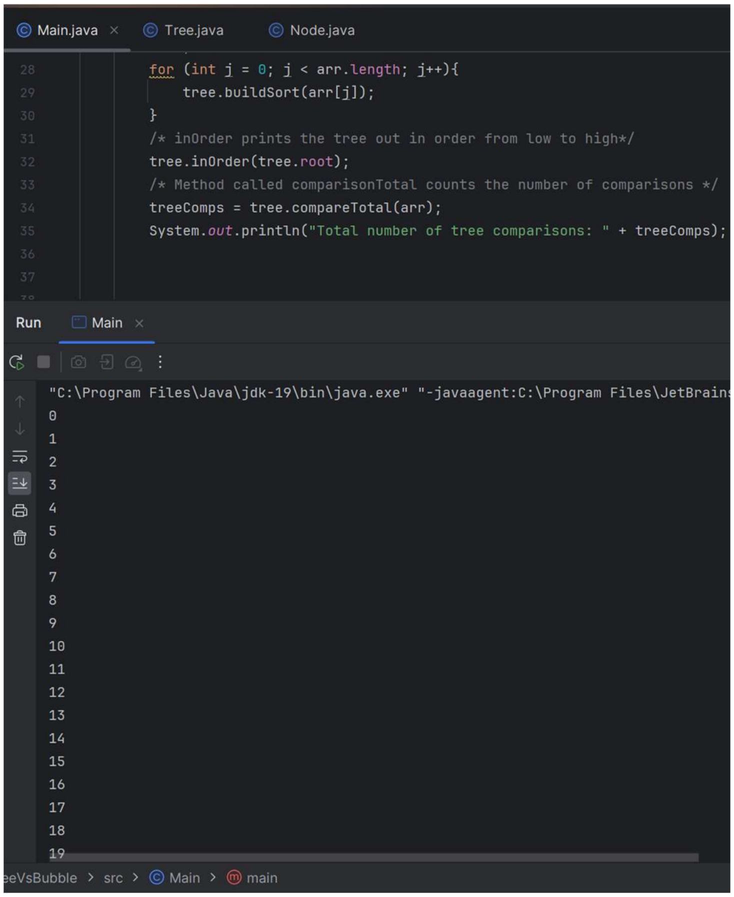
Based on memory used, the bubble sort is more efficient.



```
        for (int j = 0; j < arr.length; j++){
            tree.buildSort(arr[j]);
        }
        /* inOrder prints the tree out in order from low to high*/
        tree.inOrder(tree.root);
        /* Method called comparisonTotal counts the number of comparisons */
        treeComps = tree.compareTotal(arr);
        System.out.println("Total number of tree comparisons: " + treeComps);
```

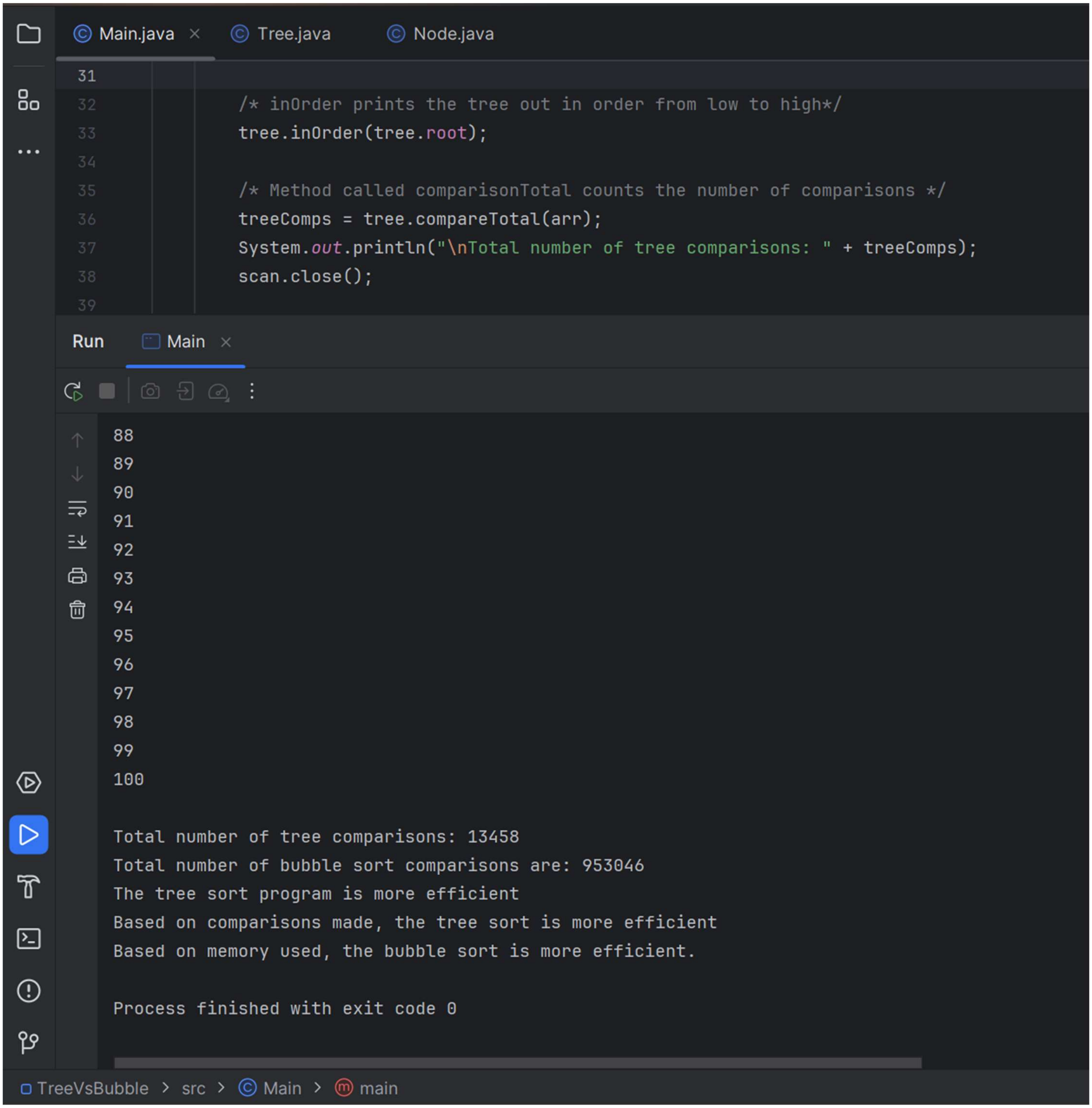
```
85
86
87
88
89
90
91
92
93
94
95
96
97
98
99
100
Total number of tree comparisons: 13458

Process finished with exit code 0
```



```
        for (int j = 0; j < arr.length; j++){
            tree.buildSort(arr[j]);
        }
        /* inOrder prints the tree out in order from low to high*/
        tree.inOrder(tree.root);
        /* Method called comparisonTotal counts the number of comparisons */
        treeComps = tree.compareTotal(arr);
        System.out.println("Total number of tree comparisons: " + treeComps);
```

```
"C:\Program Files\Java\jdk-19\bin\java.exe" "-javaagent:C:\Program Files\JetBrains
0
1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
```



```
        /* inOrder prints the tree out in order from low to high*/
        tree.inOrder(tree.root);

        /* Method called comparisonTotal counts the number of comparisons */
        treeComps = tree.compareTotal(arr);
        System.out.println("\nTotal number of tree comparisons: " + treeComps);
        scan.close();
```

```
88
89
90
91
92
93
94
95
96
97
98
99
100

Total number of tree comparisons: 13458
Total number of bubble sort comparisons are: 953046
The tree sort program is more efficient
Based on comparisons made, the tree sort is more efficient
Based on memory used, the bubble sort is more efficient.

Process finished with exit code 0
```

```
import java.util.Scanner;
import java.io.File;
import java.io.FileNotFoundException;
import java.util.Random;
public class Main {
  public static void main(String[] args) throws FileNotFoundException {
    File file = new File("\\Users\\vanna\\OneDrive\\Desktop\\CMPS 390\\CMPS 390 Assignments\\Program6Tree_vs_Bubble\\numbers.txt");
    Scanner scan = new Scanner(file);
```

```
Tree tree = new Tree();
tree.init();
int[] arr = new int[1000];
int treeComps;
int bubbleComps = 0;

/* Scans numbers from file and places them in an array */
while (scan.hasNextInt()) {
    for(int j = 0; j< arr.length; j++) {
        int num = scan.nextInt();
        arr[j] = num;
    }
}

/* Method called buildSort takes pre-sorted numbers from the
array and sorts them into a tree */
for (int j = 0; j < arr.length; j++){
    tree.buildSort(arr[j]);
}

/* inOrder prints the tree out in order from low to high*/
tree.inOrder(tree.root);

/* Method called comparisonTotal counts the number of comparisons */
treeComps = tree.compareTotal(arr);
System.out.println("\nTotal number of tree comparisons: " + treeComps);
scan.close();

int[] bubbleArray = new int[1000];
Random num = new Random();
int number;
for(int i = 0; i < 1000; i++){
    number = num.nextInt(100);
    bubbleArray[i] = number;
    //System.out.println(bubbleArray[i]);
}

/* Bubble Sort */
boolean swap = true;
while(swap) {
    swap = false;

    for (int j = 0; j < bubbleArray.length - 1; j++) {
        bubbleComps++;
        if (bubbleArray[j] > bubbleArray[j + 1]) {
            swap = true;
            int temp = bubbleArray[j];
            bubbleArray[j] = bubbleArray[j + 1];
```

```
               bubbleArray[j + 1] = temp;
            }
         }
      }

      System.out.println("Total number of bubble sort comparisons are: " + bubbleComps);
      System.out.println("The tree sort program is more efficient");
      System.out.println("Based on comparisons made, the tree sort is more efficient");
      System.out.println("Based on memory used, the bubble sort is more efficient.");
   }
} // close main


public class Node {
   public int data;
   public Node left;
   public Node right;
   int occur = 1;

   //constructor
   public Node(int data) {
      this.data = data;
      this.left = null;
      this.right = null;
   }
} // close Node


import java.util.Stack;
public class Tree {
   public Node root;
   public Node left;
   public Node right;
   public Node addNode;
   public Node curr;
   int data;
   int occur;
   boolean searching = true;
   int compareTree;
   int total = 0;
   int temp = 0;


   //constructor to initialize tree
   public void init() {
      root = null;
   }

   public int buildSort(int num){ ///////// This works!!!!!!
```

```
    Node createdNode;
    if (root == null){
      compareTree++;
      occur++;
      root = new Node(num);
    }
    else {
      curr = root;
      searching = true;
      while(searching){
        if (num == curr.data){
          curr.occur++;
          compareTree++;
          searching = false;
        }
        else if (num< curr.data){
          if (curr.left != null){
            compareTree++;
            curr = curr.left;
          }
          else{
            curr.left = new Node(num);
            compareTree++;
            searching = false;
          }
        }
        else if (num > curr.data){
          if (curr.right != null){
            compareTree++;
            curr = curr.right;
          }
          else{
            compareTree++;
            curr.right = new Node(num);
            searching = false;
          }
        }
      }
    }
    return compareTree;
  }
public void inOrder(Node t){
    if(t.left != null){
      inOrder(t.left);
    }
  System.out.println(t.data);
    if(t.right != null){
      inOrder(t.right);
    }
```

```
}

public void printIterative(Node t){
    Stack<Integer> s = new Stack<Integer>();
    s.push(root.data);
    curr = root;
    do{
      while(curr != null){
        s.push(curr.data);
        curr = curr.left;
      }
      if (!s.empty()){
        int num = s.pop();
        System.out.println(num);
        curr = curr.right;
      }

    }while(!s.empty()|| curr != null);
}

  public int compareTotal( int[] array){
    for (int j = 0; j < array.length; j++) {
      int num = array[j];
      if (root == null) {
        root = new Node(num);
      } else {
        curr = root;
        searching = true;
        while (searching) {
          compareTree++;
          if (num == curr.data) {
            searching = false;
          } else if (num < curr.data) {
            if (curr.left != null) {
              curr = curr.left;
            } else {
              curr.left = new Node(num);
              searching = false;
            }
          } else if (num > curr.data) {

            if (curr.right != null) {
              curr = curr.right;
            } else {
              curr.right = new Node(num);
              searching = false;
            }
          }
        }
```

```
            }
        }
                return compareTree;
    }
    public int compareTree(int[] array){
        for(int j = 0; j< array.length; j++) {
            compareTree = buildSort(array[j]);
            temp = compareTree + temp;
            total = temp;
        }
    return total;
    }
}
```