CS5004-5005 Spring 2020 3/12/2020

CS Lab 7. (After ALIGN Seminar) Sort Using Tree

As you heard in lecture, Hierarchical Trees can be an extremely helpful data structure in many areas of Computer Science. Often, operations on trees are conveniently handled with recursion.

In this Lab, we will look at one important algorithm used in sorting. It uses a binary tree as an intermediate data structure. Binary trees are similar to lists, but can "grow downward" from a root, with left and right branches.

The algorithm goes like this: (a) accept an array of integers in unsorted order; (b) create a binary tree by inserting the input items from the array into the tree, consecutively, always putting the smaller elements to the left and the larger elements to the right (recursively down to leaf nodes); (c) Traverse the tree in order from left to right, producing the elements in sorted order.

1. Starting from the sample code, implement a sort program in Java using a binary tree. Write tests in the main method to test on at least 1-2 examples and verify the correctness of the output. (Please avoid Googling for solutions on the web, at least initially.)

Starter code will be posted on Piazza. Upload your code and comments to GitHub. **Due by end of *next* Lab.**

2. Think about how this approach compares in time complexity to other sorting algorithms you may know about. Consider both the typical case and the worst case.

3. [OPTIONAL] Consider converting your program to work on objects other than integers – so long as sorting objects of that type is meaningful – using ***generics***. Or, return a sorted copy of the array, instead of printing!