



DATA STRUCTURES & ALGORITHMS

Lab session 4

AVL and HEAP

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1. OBJECTIVE

The objectives of Lab 4 are (1) to introduce an implementation of AVL tree in C++ and (2) to practice algorithms to handle a heap

2. EXPERIMENTS and EXERCISES

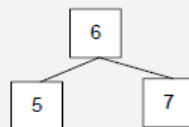
a. AVL Tree

Please observe the initial code in the files *AVL.h* and *AVL.cpp*. Accomplish the following tasks:

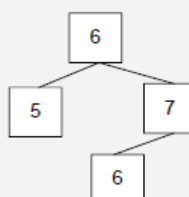
2.1. Use the pre-written method *insert* to sequentially build an AVL tree by inserting numbers in the following list one-by-one from an empty AVL: {71, 1, 4, 13, 87, 91, 72, 33, 19, 60, 59, 21, 17}. After each insertion done, call the method *printLNR* to print out the on-going tree generated.

2.2. Currently, the method *avl_insert* will raise an error when inserting a duplicated data. Modify the method such that it accepts duplicated new data. Once duplicated, the new data will be inserted to the right subtree of the corresponding node.

Example 1. Suppose we have a current tree as follows:



When we try to insert a new data of 6, the new data will be inserted to the right subtree of the duplicated node, resulting in the new tree as follows:





2.3. Consider the method *avl_remove*, which is uncompleted. Accomplish this method by replacing the commented statement “*Please fill your code here*” with appropriate code.

b. Heap

Please observe the initial code in the files *MaxHeap.h* and *MaxHeap.cpp*. Accomplish the following tasks:

2.4. Use the pre-written method *insertHeap* to sequentially build a heap by inserting numbers in the following list one-by-one: {71, 1, 4, 13, 87, 91, 72, 33, 19, 60, 59, 21, 17}. After each insertion done, call the method *prinHeap* to print out the on-going heap generated.

2.5. Do the following tasks:

- Let user input from keyboard a list of integers, ended by 0.
- Use the method *buildHeap* to build a heap from the inputted array.
- Print out the heap.

2.6. Based on the *MaxHeap* class, develop the *MinHeap* class and resolve the exercises 2.4 and 2.5 with the developed *MinHeap*.

2.7. Accomplish the uncompleted methods *ReheapDown* and *deleteHeap*.

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