CS163 – Data Structures & Algorithms

Week 05
AVL Tree

Cảm ơn thầy Trần Duy Quang đã cung cấp template cho môn học

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Notes

Create a single solution/folder to store your source code in a week.

Then, create a project/sub-folder to store your source code of each assignment.

The source code in an assignment should have at least 3 files:

- A header file (.h): struct definition, function prototypes/definition.
- A source file (.cpp): function implementation.
- Another source file (.cpp): named YourID_Ex01.cpp, main function. Replace 01 by id of an assignment.

Make sure your source code was built correctly. Use many test cases to check your code before submitting to Moodle.

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Content

In this lab, we will review the following topics:

- What is an AVL tree? How to manipulate it?

3

Assignments

A: YY: 01

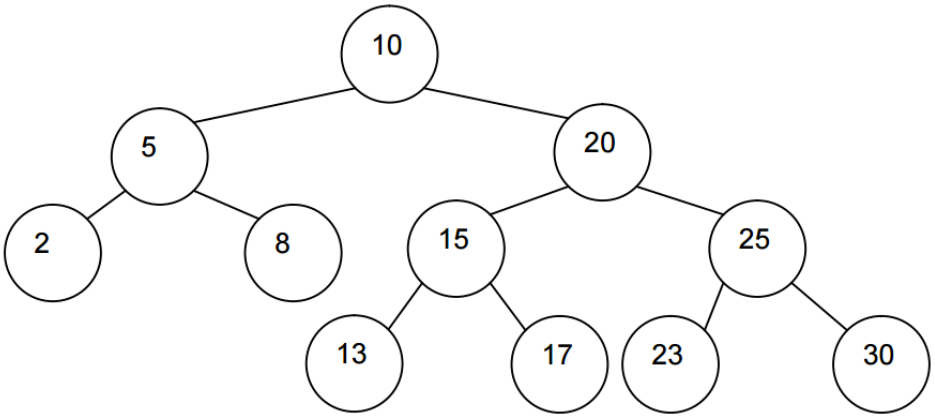
H: YY: 05

Visualization:

1. https://www.cs.usfca.edu/~galles/visualization/Algorithms.html
   a. 23 tree: **UNCHECK** option "Preemtive Split / Merge"
   b. 234 tree: **CHECK** option "Preemtive Split / Merge"
2. https://visualgo.net/en

3.1. Paper Assignment

1. Given an sequence of numbers from 1 to 10. Draw a binary search tree with minimum height.
2. Draw an AVL tree of height 4 that contains the minimum possible number of nodes.
3. Give an example For each type of imbalance (left-left, right-right, left-right, right-left imbalances). Draw an AVL tree at each case and write the sequence of numbers to create that tree.
4. Given the following AVL tree:
   a. What values could you insert to cause a **right-right imbalance**, and at which node does the imbalance occur?
   b. How about a **right-left imbalance**? At which node does the imbalance occur?
   c. Insert 18 into the following AVL tree. What type of imbalance does it cause? Show the result after balancing.



5. Draw an AVL tree when we insert list of numbers as follow : 74, 12, 217, 36, 61, 77, 286, 153, 337, 93, 121, 47, 463, 248 and 146 into the tree one by one.

3.2. Insertion of AVL tree

Load a list of integer numbers from a text file to an AVL tree.

Save the tree to another text file in in-order traversal.

3.3. SAMETREE - Identical Binary Trees

Credit: Hà Đức Minh Thảo

https://www.interviewbit.com/problems/identical-binary-trees/

3.4. K-th Smallest Element In Tree

Credit: Hà Đức Minh Thảo

https://www.interviewbit.com/problems/kth-smallest-element-in-tree/

3.5. Symmetric Tree

https://leetcode.com/problems/symmetric-tree/