Technische Universität München
Institut für Informatik
Theoretical Computer Science

Fundamental Algorithms 6

Exercise 1 (Flat Trees)

Write an algorithm that copies all keys that are stored in a binary search tree into an array of appropriate size. In the resulting array, the keys shall be sorted in descending order.

Exercise 2 (Growing Trees)

Consider the binary tree given by the expression

$$x = (5, (3, \emptyset, (4, \emptyset, \emptyset)), (8, (6, \emptyset, \emptyset), (10, (9, \emptyset, \emptyset), (13, \emptyset, \emptyset))))$$

1. Draw a diagram of this binary tree and decide whether it is a binary search tree.
2. Perform the following operations (using the algorithms from the lecture) and draw a diagram of the search tree after each operation: INSERT$(x, 11)$; DELETE$(x, 5)$; INSERT$(x, 5)$; INSERT$(x, 13)$

Exercise 3 (AVL Trees)

Decide whether the binary tree given in Exercise 2 is an AVL tree

- before the insert/delete operations, and
- after each of the regular insert and delete operations.

Again, perform the insert/delete operations given in Exercise 4, and, if required, perform the rotation(s) to restore the AVL property after each step. Draw a diagram of the search tree after each of your insert, delete, and rotation operations.