50.004 Introduction to Algorithms, Fall 2015
Singapore University of Technology and Design 7 Oct., 2015
Simon Lui Home Exercises - Week 4

Student Information

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Due Date: 12-Oct. 4:00pm.
Submit written answer on paper in class or submit electronic version online through Dropbox. Submission without student information will **NOT** be marked!

Exercise 1

You are given a list of n numbers and you like to design a sorting algorithm that uses BSTs. In particular, you construct a corresponding BST by inserting the keys of the list one by one, and then output the nodes using an in-order traversal of the tree.

Question1

Then the complexity is A

A. $\Theta(n)$

B. $\Theta(n \log n)$

C. $\Theta(n^2)$

Question2

Suppose that you use a balanced BST instead. Then the complexity is A

A. $\Theta(n)$

B. $\Theta(n \log n)$

C. $\Theta(n^2)$

Exercise 2

In the runway scheduling problem when we insert a new event with time t in the already existing BST we follow a certain path from the root of the tree.

1. The consistency condition about $|t - t_i| \geq 3$ for all already existing times t_i in the tree can be checked by only considering nodes along the path of the insertion? (T/F) T

2. Or once we insert the new node we need to check the condition on more nodes, not just on the insertion path? (T/F) F

3. We augment the information of the nodes of a balanced BST so that we can answer more questions about the keys stored in the BST in ___A___

   A. $O(\log n)$

   B. $O(n)$

Exercise 3

1. We have n keys already stored as a Max-Heap and as an AVL tree. Since both have a maximum depth of $O(\log n)$, searching if k is in the set of keys takes the same time complexity. (T/F) F

2. A Max-heap captures the same information as a balanced BST regarding the ordering of the keys of the nodes. (T/F) F

3. Outputing the keys in increasing order from a given Min-Heap and a balanced BST take the same time complexity. (T/F) F