Recitation Note - CS430 Fall 2014

Taeho Jung
Illinois Institute of Technology

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- I do not guarantee I will prepare a note for every recitation.
- This is a rough review for the HW 3 and exam 1.

1 Annihilators & Big-Oh notations

Need to know how to find the annihilator from the recurrence relation, and how to find out general solutions from the annihilators. Also, need to know how to find/use the big-oh notations for functions.

2 Quick sort, Insertion sort, Heap sort, and Merge sort

Need to know how they behave. Specifically, it is important to know how each element is moved or handled at each iteration. Also, what is the best/average/worst case of the sorting algorithms?

** But exams will never directly ask such a silly question...

3 Binary tree, Heap, and Red-black tree

Need to know how a node is searched, inserted, or deleted in a binary tree/heap/red-black tree. Also, how is heap implemented in an array?

4 About HW 3

Problem 3 and 4 become easy if you find out the proper loop invariants for RB-Insert-Fixup and RB-Delete-Fixup.

In the first algorithm, the loop invariant is:

$$(z \neq T.root \wedge z \text{ is red}) \vee (z \text{ is red} \wedge z\text{'s grandchild is red})$$

(case 2, 3) (case 1)

Therefore, when the loop terminates, it is either z remains red or z becomes black but its grandchild remains red.

In the second algorithm, the loop invariant is:

$$(\text{highest node involved so far is black}) \vee (x \text{ is the highest node involved so far})$$

(case 1) (case 2, 3)

Therefore, when the loop terminates, it is either x is the height node involved throughout the loop (which turns black at the end), or the highest node involved in the loop is black. If the highest node in the loop is the loop, the root is black in both cases. If it is not the root, the root remains unchanged, therefore it is black.

5 Tip for the exam

- Do not need to write essays. If you are starting to writing an essay, there must be something wrong with your answer.
- Only need to use plain English to describe your algorithm. No need to write a perfect code.
- Please read the hint or references in the problems. They are not there for no reasons.
- Please bring the hard copies of 1) lecture notes, 2) HW solutions, and 3) textbook. No electronic devices will be allowed.