CS3114 Fall 2011 Homework Assignment 2
Due Thursday, October 20 at 11pm
50 points

Submissions for this assignment must obey the course General Assignment Guidelines. You can find a link to this at the top of the Assignments page on the course website.

1. Using the weighted union rule and path compression, show the array for the parent pointer implementation that results from the following series of equivalences on a set of objects indexed by the values 0 through 15. Initially, each element in the set should be in a separate equivalence class. When two trees to be merged are the same size, make the root with greater index value be the child of the root with lesser index value.

(2, 3) (4, 5) (6, 5) (3, 5) (1, 0) (7, 8) (1, 8) (3, 8) (9, 10) (11, 14) (11, 10) (12, 13) (11, 13) (14, 1)

2. Sequential tree representations

(a) Write out the sequential representation for Figure 6.18 of the textbook using the coding illustrated by Example 6.5.

(b) Write out the sequential representation for Figure 6.18 of the textbook using the coding illustrated by Example 6.6.

3. Give a permutation for the values 0 through 7 that will cause Quicksort (as implemented in Section 7.5 of the textbook) to have its worst case behavior. Explain how you got your answer, or show the steps that you went through.

4. Use an argument similar to that given in Section 7.9 of the textbook to prove that $\log n$ is a worst-case lower bound for the problem of searching for a given value in a sorted array containing n elements.

5. Modify Quicksort to find the smallest k values in an array of records. Your output should be the array modified so that the k smallest values are sorted in the first k positions of the array. Your algorithm should do the minimum amount of work necessary, that is, no more of the array than necessary should be sorted.