CSCI 303 Algorithms

Homework 9

Due: 11:00 in class, November 13, 2001

1. (10 points) In the closest-pair problem, let P be a point set with n points. Let X be the same point set sorted by x-coordinates. For points with the same x-coordinate, they are sorted by y-coordinates. Let Y be the same point set sorted by y-coordinates. For points with the same y-coordinate, they are sorted by x-coordinates. Recall that the closest-pair algorithm uses an imaginary vertical line to bisect X into X_L and X_R, which is easy to implement. As a result, Y is also partitioned into Y_L and Y_R, where Y_L and Y_R are the same point sets as X_L and X_R, respectively, sorted by y-coordinates. Describe in words a $O(n)$-time algorithm to create a partition of Y into Y_L and Y_R.

2. (10 points) Use the divide-and-conquer approach to write an algorithm that finds the largest item in a list of n elements. Analyze your algorithm and show the time complexity in big-O notation.

   You may call your algorithm `SelectMax(A)`, which is a function that returns the maximum value in A. Don't forget to start your algorithm with an "if" statement that specifies the base case for the recursive algorithm. Once you have the algorithm, the time complexity should be represented by a recurrence relation. Solving the recurrence relation gives you the time complexity in big-O.