COSC 2123/1285 Algorithms and Analysis
Tutorial 5
Divide and Conquer Algorithmic Paradigm

Objective

Students who complete this tutorial should:

- Understand the concepts of divide and conquer.

- Be familiar with the way this concept can be applied to sorting problems.

Questions

5.1.6 Apply mergesort to sort the list E, X, A, M, P, L, E in alphabetical order.

5.2.1 Apply quicksort to sort the list E, X, A, M, P, L, E in alphabetical order.

5.1.7 Is mergesort a stable sorting algorithm?

5.2.3 Is quicksort a stable sorting algorithm?

5.1.1

a Write a pseudocode for a divide-and-conquer algorithm for finding a position of the largest element in an array of n numbers.

b What will be your algorithm's output for arrays with several elements of the largest value?

c Set up and solve a recurrence relation for the number of key comparisons made by your algorithm.

d How does this algorithm compare with the brute-force algorithm for this problem?

5.2.11 *Nuts and bolts* You are given a collection of n bolts of different widths and n corresponding nuts. You are allowed to try a nut and bolt together, from which you can determine whether the nut is larger than the bolt, smaller than the bolt, or matches the bolt exactly. However, there is no way to compare two nuts together or two bolts together. The problem is to match each bolt to its nut. Design an algorithm for this problem with average-case efficiency of $\Theta(n \log n)$.