

Data Structures and Algorithms COMP-251

Problem Assignment #5

1. Algorithms on Sequences

You are given a sequence S of n real numbers, where n is even.

(a) Design an algorithm to partition S into $n/2$ pairs in the following way. For each pair we compute the sum of its two numbers, obtaining $n/2$ sums. The algorithm should find the partition that minimizes the *maximum* sum.

(b) Prove the correctness of your algorithm.

2. Edit Distance between Strings

Let $A = a_1, a_2, \dots, a_n$ and $B = b_1, b_2, \dots, b_m$ be two strings of characters. Denote by $A[i]$ the string a_i, a_{i+1}, \dots, a_n . Let d_i be the minimal edit distance between B and $A[i]$. Design an $O(n^2)$ time algorithm to find the minimum value of d_i over all $i = 1, 2, \dots, n$.

3. Graph Embeddability

(a) Prove that a graph G is embeddable in the *plane* if and only if it is embeddable on the *sphere*.

(b) Prove that a planar embedding of a graph can be transformed into a different planar embedding such that any specified face becomes the exterior face.

For COMP-252 students only

Problem Assignment #5

1. Quicksort

Construct an example for which quicksort will use $\Omega(n^2)$ comparisons when the pivot is chosen by taking the median of the first, last, and middle elements of the sequence.