

2000 Paper 6 Question 1

Data Structures and Algorithms

Describe an $O(n \log(n))$ algorithm based on a variation of merge sort to find the closest pair of a given set of points lying in a plane. You may assume that the set of points is given as a linked list of (x, y) coordinates. [8 marks]

Carefully prove that your algorithm can never take longer than $O(n \log(n))$. [6 marks]

Modify, with explanation, your algorithm to find the pair of points with minimum Manhattan distance. The Manhattan distance between points (x_1, y_1) and (x_2, y_2) is $|x_1 - x_2| + |y_1 - y_2|$. [6 marks]