

# Design of Algorithms by Divide And Conquer Technique for Some Problems

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## **Approach: Divide and Conquer- The Closest Pair of Points**

**Problem:** Given a set of  $n$  points in the plane, find a pair of closest points

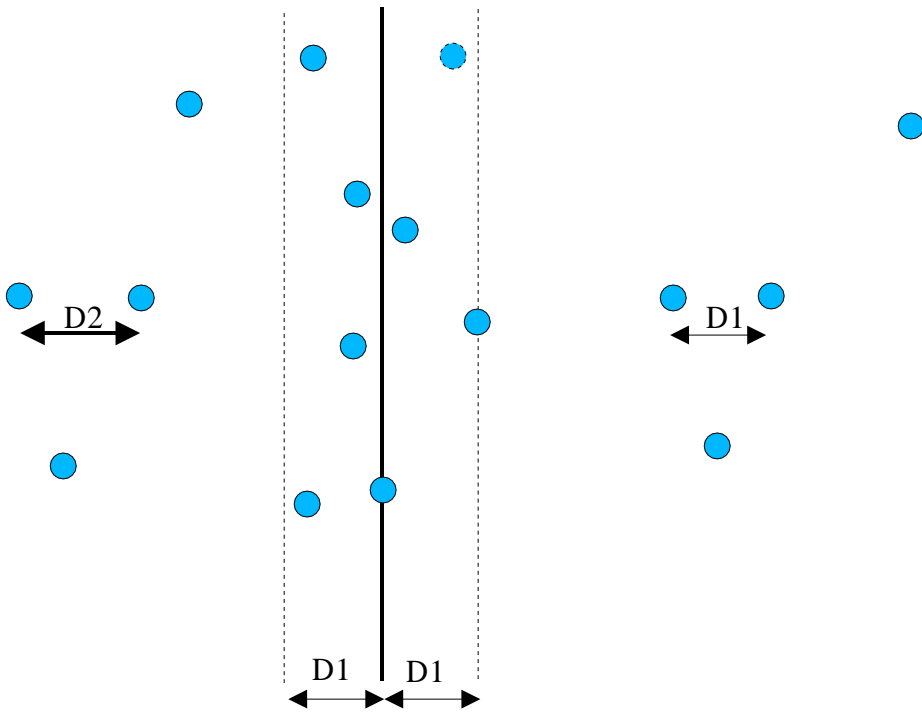
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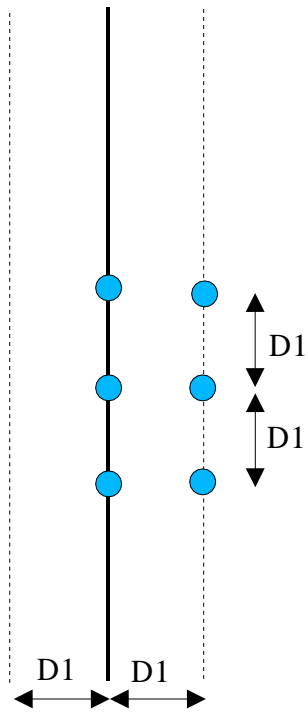
Closest Pair Problem

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The worst case of six points  $d1$  apart

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**Algorithm Closest\_Pair**( $p_1, p_2, \dots, p_n$ )

**Input:**  $p_1, p_2, \dots, p_n$  a set of  $n$  points in the plane

**Output:**  $d$  (the distance between the two closest points)

**begin**

**Sort** points according to their  $x$ -coordinates;

    {comment-this sorting is done only once }

**divide** the set into two equal-sized parts;

**Recursively**, compute the minimal distance  
        in each part;

    Let  $d$  be the minimal of the two minimal distances;

**Eliminate** points that lie farther than  $d$  apart  
        from the separation line

**Sort** the remaining points according to  
        their  $y$  coordinates;

    Scan the remaining points in the  $y$  order and find  
        the distance of each point to its five neighbors;

**if** any of these distances is less than  $d$   
        **then** update  $d$

**end.**

Reference Udi Manber page 280

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## **Approach: Divide and Conquer- The Sky-line Problem**

**Problem:** Given the exact locations and shapes of several rectangular buildings in a city, draw the skyline (in two dimensions) of these buildings, eliminating hidden lines.

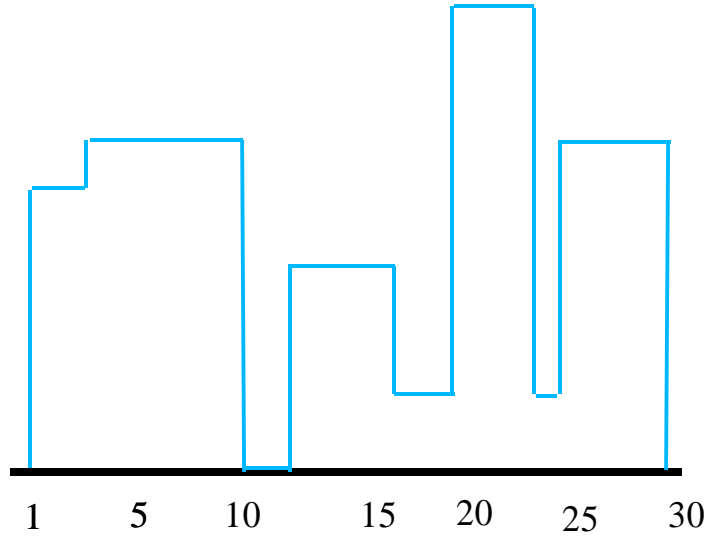
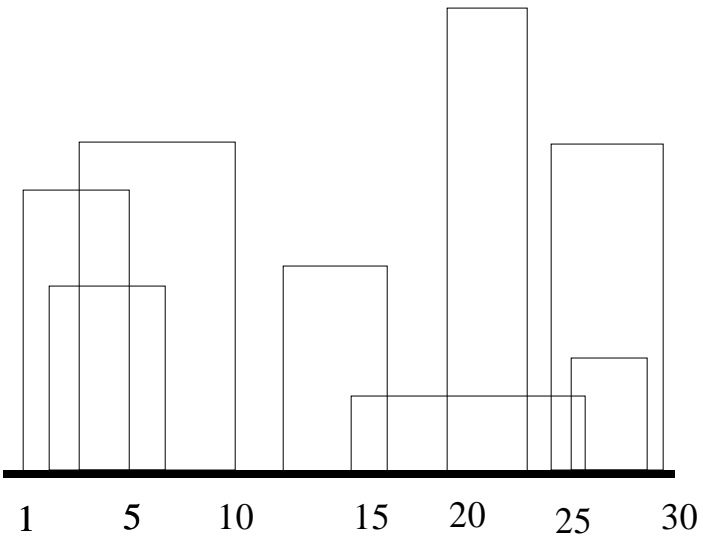
Reference Udi Manber page 102

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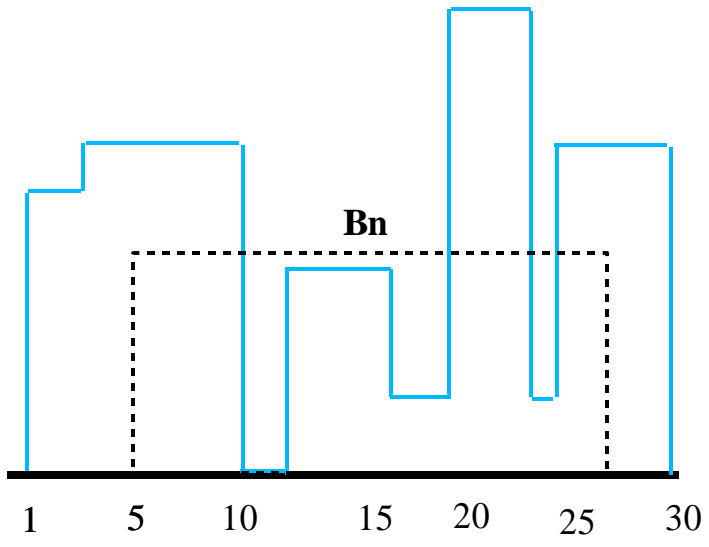


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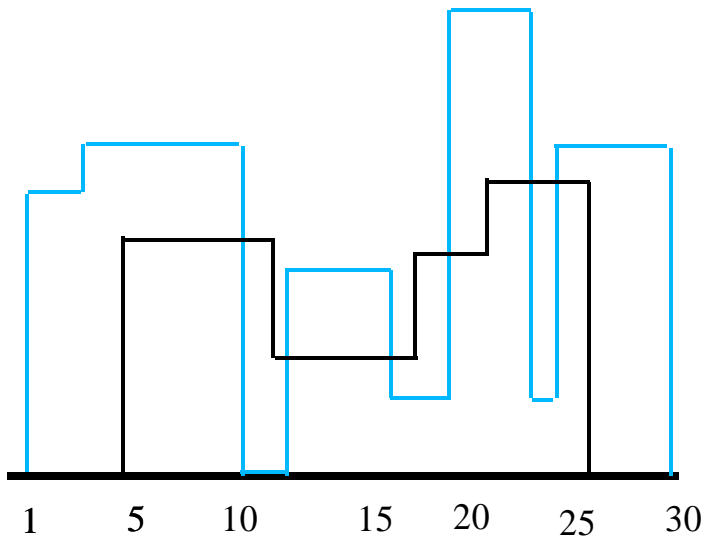
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Merging two skylines

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## **The Skyline Problem- Representation**

### **input representation:**

The buildings in the example are represented by the following list:

(1, 11, 5), (2, 6, 7), (3, 13, 9), (12, 7, 16), (14, 3, 25)  
(19, 18, 22), (23, 13, 29), (24, 4, 28)

The skyline is represented by:

(1, 11, 3, 13, 9, 0, 12, 7, 16, 3, 19, 18, 22, 3, 23, 13, 29, 0)

Reference Udi Manber page 102

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