

PAL lab 13

December 13, 2022

Two empty R-B trees are isomorphic. Two unempty R-B trees T_1 , T_2 with roots K_1, K_2 are isomorphic iff K_1 and K_2 share the same color and the following hold:

- ▶ ($K_1.L$ is isomorphic to $K_2.L$ and $K_1.R$ is isomorphic to $K_2.R$) or
- ▶ ($K_1.L$ is isomorphic to $K_2.R$ and $K_1.R$ is isomorphic to $K_2.L$).

Terms $K_1.L$, $K_1.R$, $K_2.L$, $K_2.R$ denote left and right subtrees of K_1 and left and right subtree of K_2 .

Compute the number of non-isomorphic R-B trees with 2, 3, ..., 12 node.

Build a k-d tree containing the following points in the plane with coordinates: (50, 50), (20, 35), (60,15), (30, 40), (50, 40), (40, 50), (15, 60), (15, 35), (35, 40).

Insert the points into the tree in the given order.

The outer loop iterates through x -coordinates of the points in the plane starting from $x = 10$ and ending at $x = 40$ with $\text{step} = 10$. The inner loop iterates through the y -coordinates of the points starting from $y = 50$ and ending at $y = 80$ with $\text{step} = 10$. Each point is inserted into an originally empty k -d tree in the order imposed by the progress of the loops. Draw the resulting k -d tree.

Delete the points $(10, 50)$, $(20, 60)$, $(30, 70)$, $(30, 60)$ (in this order) from the k-d tree built in the previous problem. Draw the resulting k-d tree.