KDTREE

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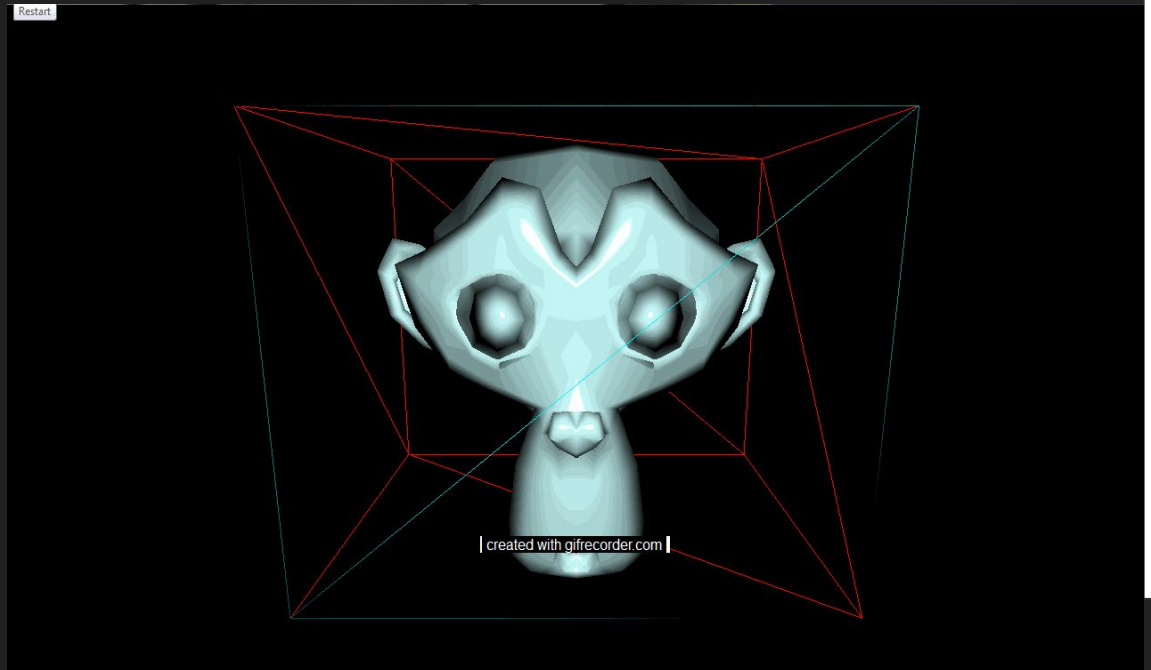
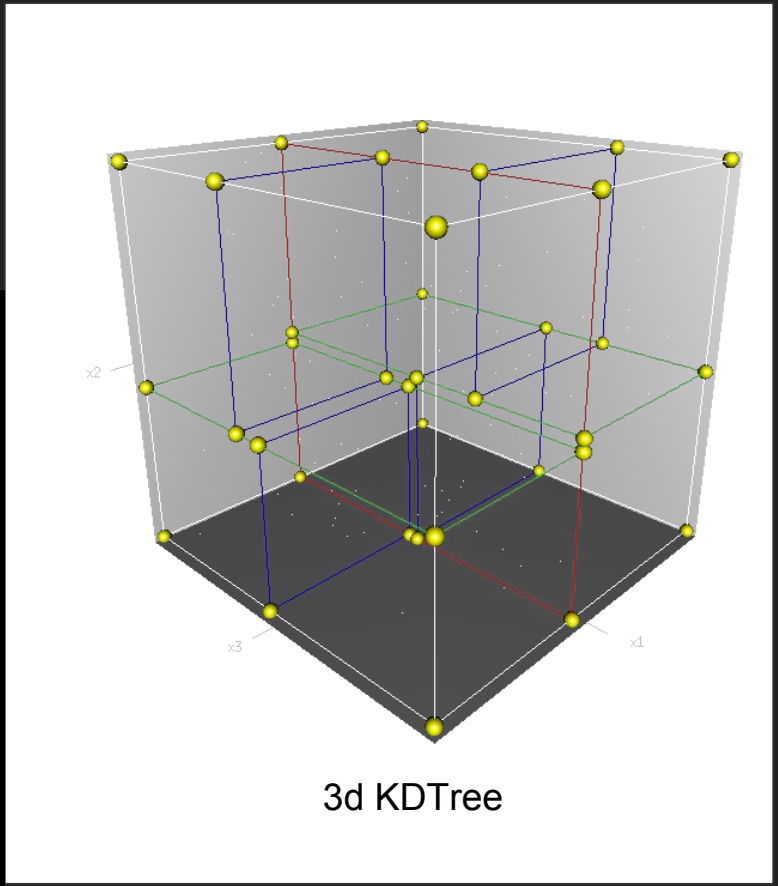
What is a KDTree

KDTree is a binary tree that represents k-dimensional spatial data

Each coordinate represents the search key





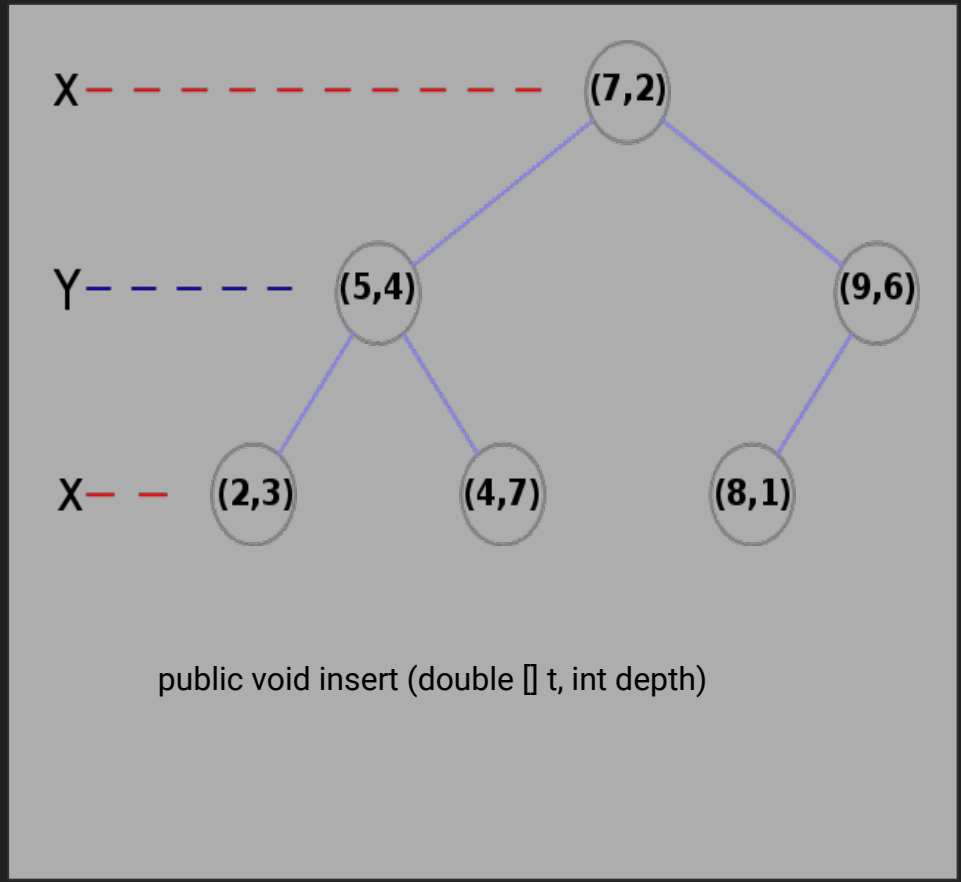
3d KDTree

Construction && Methods

Insertion

K-dimensions (k1,...,kn)

1. Create root node
2. Ex.: Insert point = (5,6). Check if point' s k1 axis (5) is <, >= than that of node (7)
3. If < recursively insert in left subtree, now comparing k1 axis (y) (6>4)
4. If >= recursively insert in right subtree
5. If insert () reaches the leaf => create a new KDNode (right child of (4,7))



public void insert (double [] t, int depth)

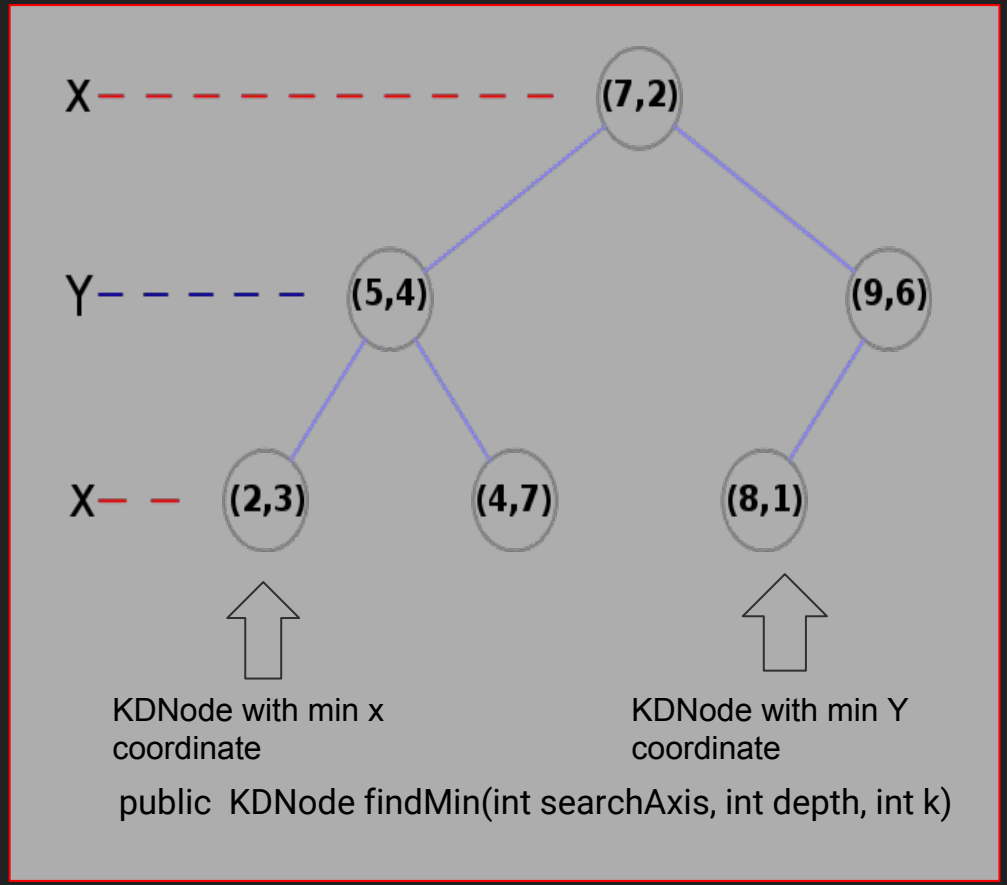
Construction && Methods

FindMin

1. If current axis(dimension) == axis of the given point, call findMin() on left subtree, if it's not null
2. If current axis != axis of given point, minimum can be

- Left subtree
- Current node
- Right subtree

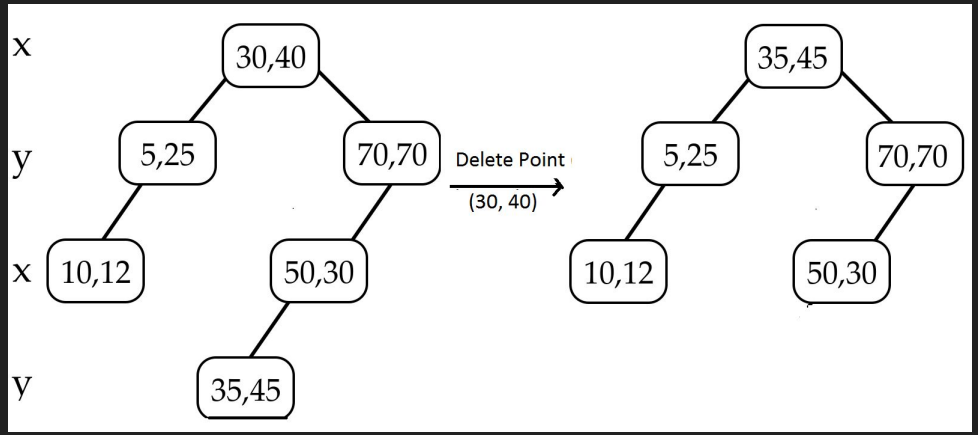
3. Return the minimum Node

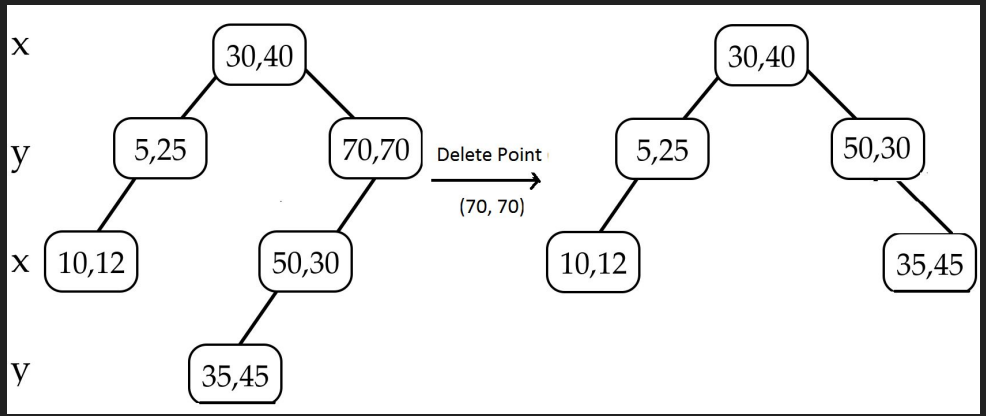


Construction && Methods

public void delete(double[] t, KDNode parent, int depth)

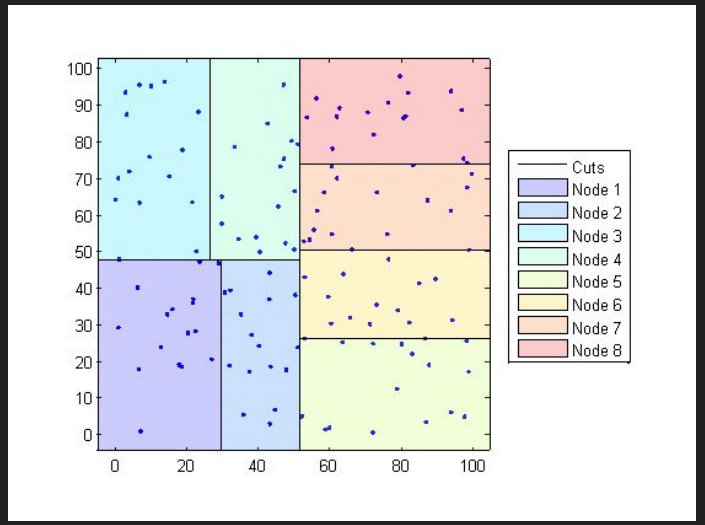
1. If node to be deleted is leaf, set it to null (as in BSTree)
2. If node's right child != null ->Find min in right subtree. Replace node's data with min and delete min in right subtree
3. If node's left child != null ->Find min in left subtree. Replace node' s data, delete min in left subtree. Set left's subtree as right child of node

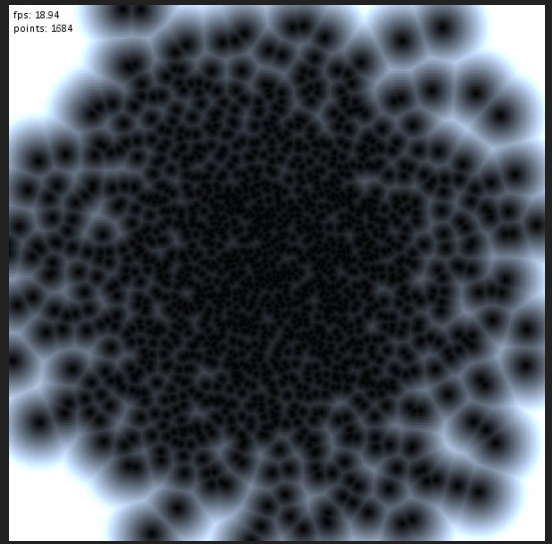


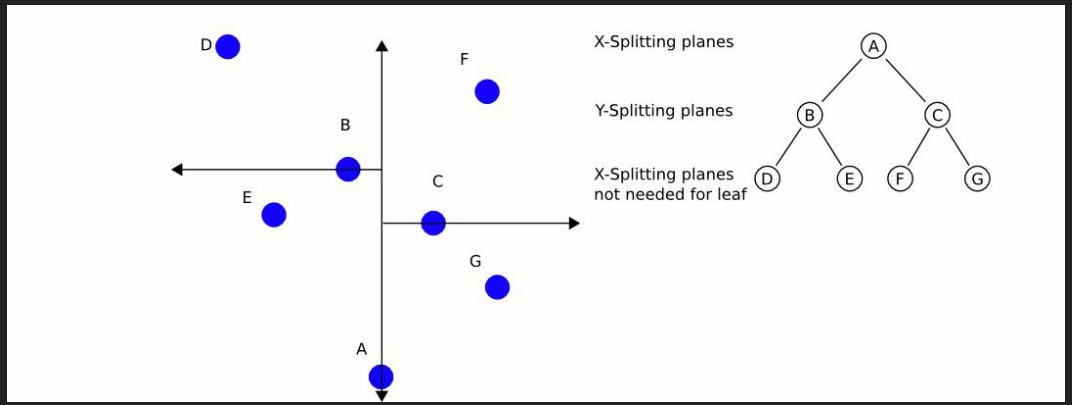


Applications

- Nearest Neighbor search
- n-Body Problem
- Color Reduction







Applications

- Range Queries
- Spatial Partitioning
- Ray Tracing