Date 12 Oct 2022

Maths Scribd Notes -24

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Binary search tree

Rank of a node: Number of nodes smaller than it plus 1.

Global rank: Number of nodes smaller than it plus 1.

Local rank: rank of a node in a considered subtree

Base rank: Smallest global rank in a considered subtree

Base rank = global rank – local rank + 1

Recursive formula for calculating base rank :

Base_rank(Root[T]) = 1

Base_rank(left[x]) = Base_rank(x)

Base_rank(right[x]) = Base_rank(x) + Local_rank(x)

Recursive formula for calculating Size of a subtree:

Subtree_size(x) = Subtree_size(L(x)) + Subtree_size(R(x)) + 1

Tree Traversals –

1. Preorder : Root -> Left -> Right
2. Inorder : Left -> Root -> Right
3. Postorder : Left -> Right -> Root

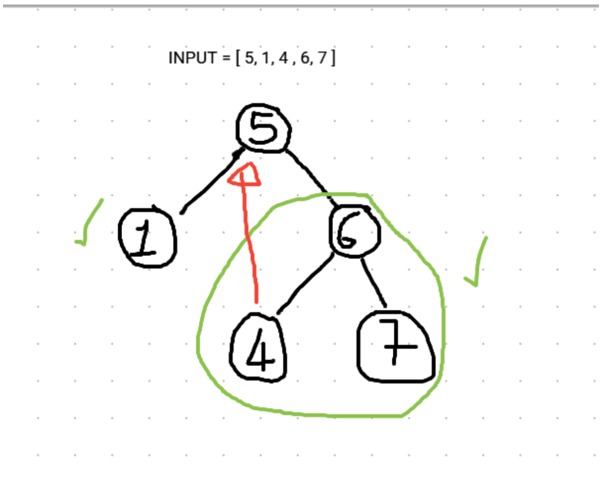
Searching algorithmic approaches -

1. Breadth First Search
2. Depth First Search

Time complexity of sorting algorithms –

Mergre sort : 2T(n/2) + Cn

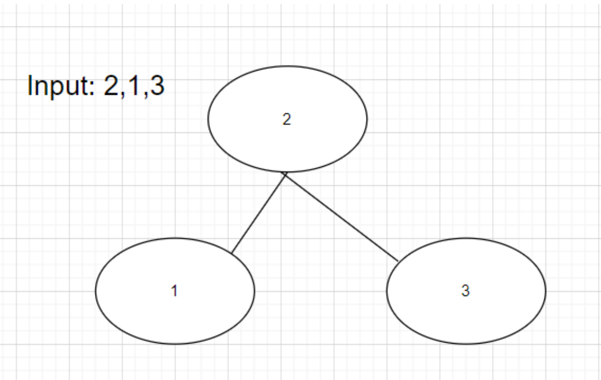
Validity of a Binary Search tree –

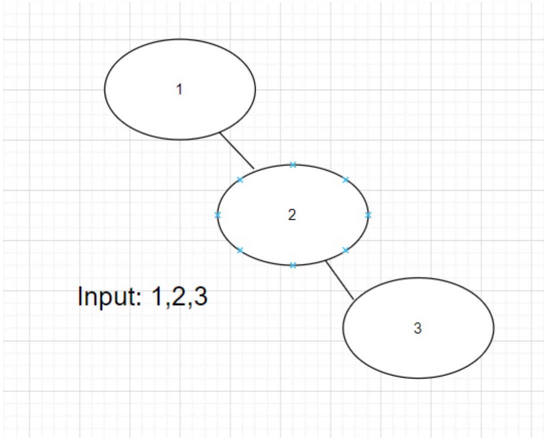


Eg. This is BST is invalid because the node ‘4’ can’t be in the right sub-tree of node ‘5’.

Since property of a BST = all nodes in LST of a node should be lesser in value than that node’s value and all nodes in its RST should be greater in value than its value.

Difference in formation of BST by varying the input sequence –



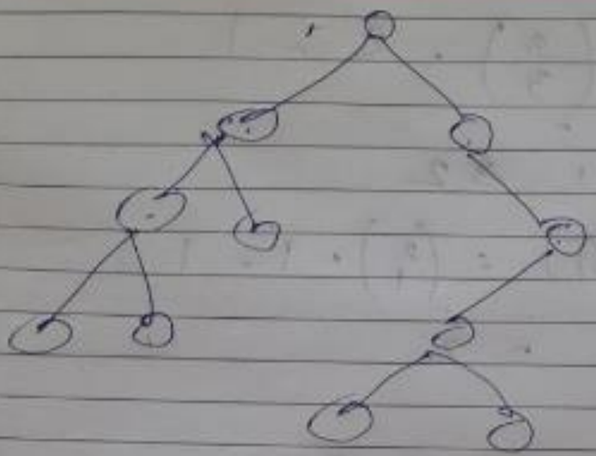


Number of different input sequences for obtaining the same BST structure –

Tree

$$o(T) = \binom{|T|-1}{|L(T)|} \cdot o(L(T)) \cdot o(R(T))$$

Eg. for the shown below BST structure, we have calculated the number of different input sequences for obtaining the same BST structure;



$$\binom{11-1}{5} \cdot O(L(5)) \cdot O(R(5))$$

$$252 \cdot 8 \cdot 2$$

$$O(5) = \binom{5-1}{3} \cdot O(L(3)) \cdot O(R(1))$$

$$4 \cdot 2 \cdot 1$$

$$= 8$$

$$O(3) = \binom{2}{1} \cdot 1 \cdot 1$$

$$= 2$$

$$O(5) = \binom{5-1}{0} \cdot O(L(0)) \cdot O(R(4))$$

$$= 1 \cdot 2$$

$$O(R(4)) = \binom{4-1}{3} \cdot O((3))\ R(0)$$

$$\binom{3}{3} \cdot 2 \cdot 1$$

$$=$$

$$\cancel{D(L(3))} = \cancel{3}\,2$$

$$D(L(3)) = \binom{2}{1} \cdot 1 \cdot 1$$

$$= 2$$

$$252 \cdot 8 \cdot 2$$

$$= 4032$$