Data Structures

Topic: Deletion in AVL Tree

By

Ravi Kant Sahu

Asst. Professor,

Lovely Professional University, Punjab

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Introduction

- An element can be deleted from AVL tree which may change the BF of a node such that it results in unbalanced tree.

- Some rotations will be applied on AVL tree to balance it.

- R rotation is applied if the deleted node is in the right subtree of node A (A is the node with balance factor other than 0, 1 and -1).

- L rotation is applied if the deleted node is in the left subtree of node A.

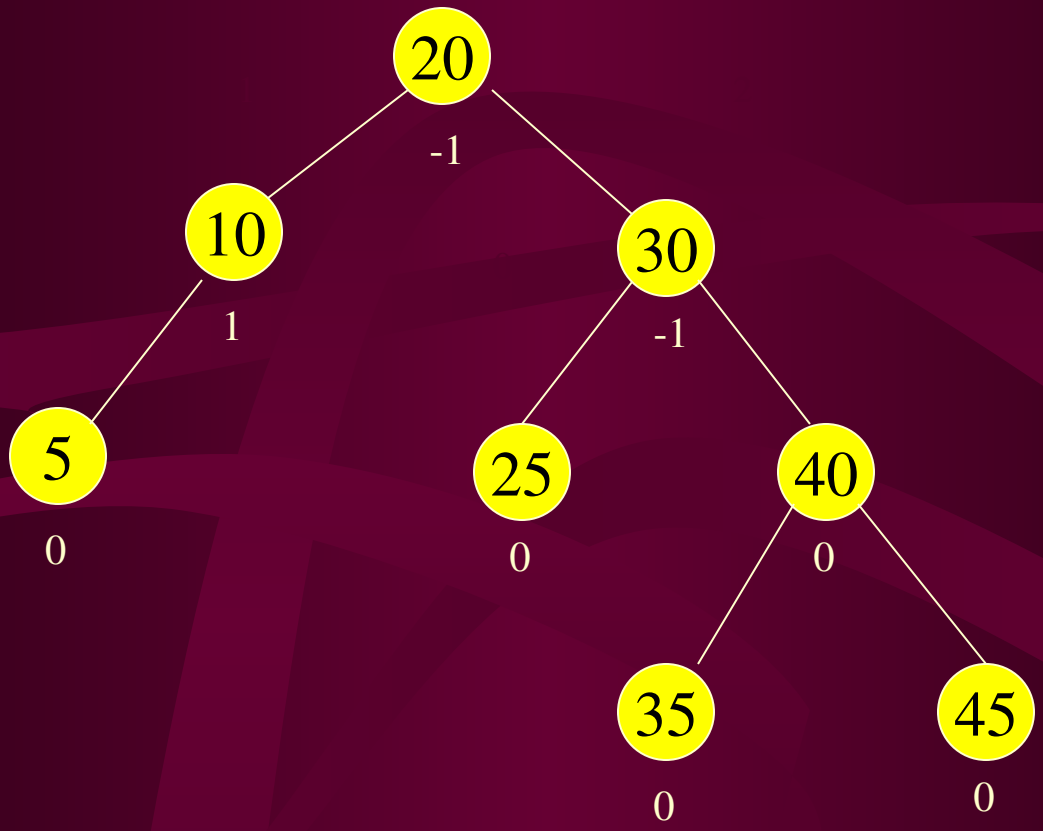
Introduction

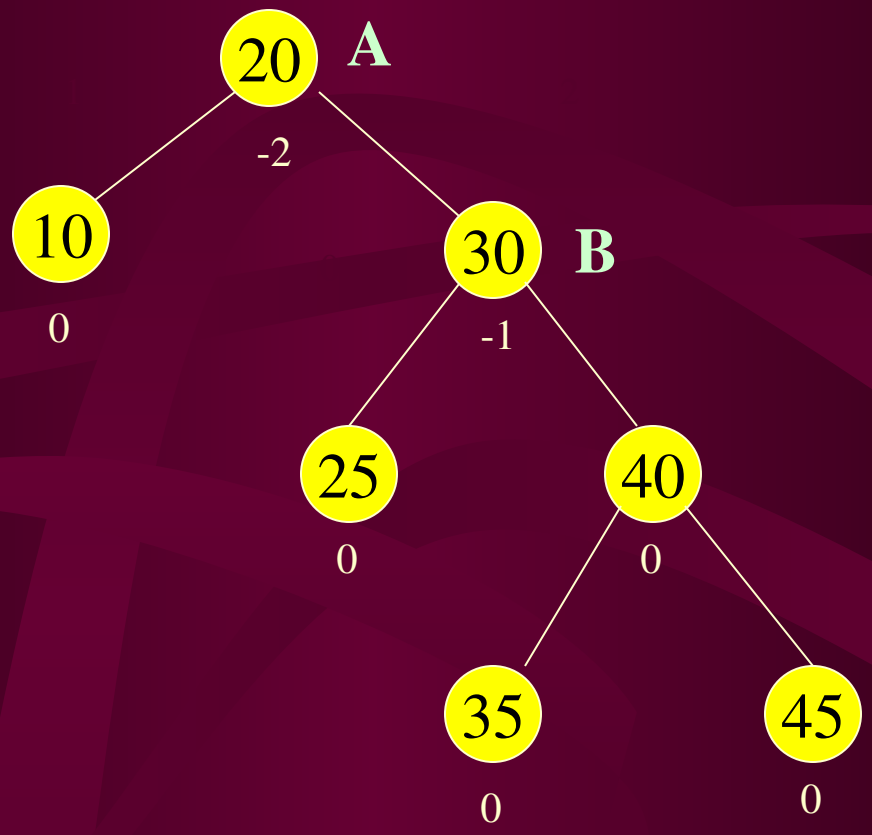
- Suppose we have deleted node X from the tree.

- A is the closest ancestor node on the path from X to the root node, with a balance factor -2 or +2.

- B is the desendent of node A on the opposite subtree of deleted node i.e. if the deleted node is on left side the B is the desendent on the right subtree of A or the root of right subtree of A.

Delete 5




20
A
-2
10
0
30
B
-1
25
0
40
0
35
0
45
0

R Rotation

- R Rotation is applied when the deleted node is in the right subtree of node A.
- There are three different types of rotations based on the balanced factor of node B.

- **R0 Rotation:** When the balance Factor of node B is 0.
- Apply LL Rotation on node A.
- **R1 Rotation:** When the balance Factor of node B is +1.
- Apply LL Rotation on node A.
- **R-1 Rotation:** When the balance Factor of node B is -1.
- Apply LR Rotation(RR rotation on B and LL rotation on node A).

L Rotation

- L Rotation is applied when the deleted node is in the left subtree of node A.
- There are three different types of rotations based on the balanced factor of node B.

- **L0 Rotation:** When the balance Factor of node B is 0.
- Apply RR Rotation on node A.
- **L-1 Rotation:** When the balance Factor of node B is -1.
- Apply RR Rotation on node A.
- **L1 Rotation:** When the balance Factor of node B is 1.
- Apply RL Rotation(LL rotation on B and RR rotation on node A).

Important

- Unlike insertion, fixing the node A won't fix the complete AVL tree.

- After fixing A, we may have to fix ancestors of A as well.

Questions