CS 1203: Data Structures **Semester:** Monsoon 2023

Assignment #6

Instructor: Subhamoy Mitra
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Broad topics discussed:

1. Height balanced binary trees (AVL): AVL trees are self balancing binary trees that have a balance factor -1,0,1 and a balance factor other than these causes an imbalance in the tree. The balance factor is thus calculated as height of the left child - height of the right child. Balance factor of a parent is calculated as the height of the node - max(heights of both child).

2. Rotations in AVL trees: AVL trees retain the BST property where the left child key is less than the parent and right child's greater. Thus, while inserting an element into the AVL trees, if this property gets violated, AVL trees performs rotations to maintain balance and these rotations are calculated using balancing factors and then executed.

3. Balancing Rotations: The two primary types of rotations used to rebalance AVL trees are:
Single Left Rotation (LL Rotation): When a node's balance factor becomes -2 and the right subtree is heavier, a single left rotation is performed to bring balance.
Single Right Rotation (RR Rotation): When a node's balance factor becomes 2 and the left subtree is heavier, a single right rotation is performed to restore balance.
Double Left-Right Rotation (LR Rotation): When a node's balance factor becomes -2, and its right subtree's balance factor is 1 (indicating a left-heavy right subtree), a double left-right rotation is used to restore balance.
Double Right-Left Rotation (RL Rotation): When a node's balance factor becomes 2, and its left subtree's balance factor is -1 (indicating a right-heavy left subtree), a double right-left rotation is performed to maintain balance.

The insertion and deletion thus remains similar to the binary trees in AVL.

Time Complexity:
The time complexity of search, insertion, and deletion operations in AVL trees is O(log n), where n is the number of nodes in the tree, similar to BST.