

AVL Trees

Goal - invariant of AVL tree

Maintain height balance.

That is, the height of every node's left and right subtrees differ by no more than 1.

Calculating Height

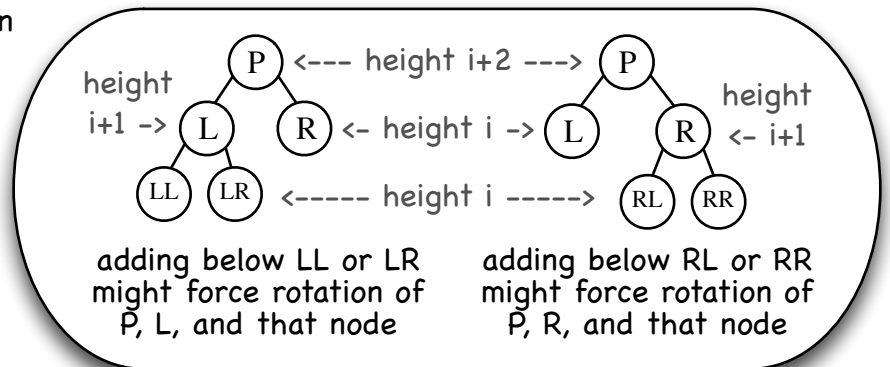
- height of null node is -1
- height of a leaf is 0
- a node's height is the max height of its subtrees + 1

Maintaining Balance

- recalculate height after insertion
- rotate after insertion to balance but only if needed
- rotate from above

When Do Rotations Happen?

- start with an AVL tree that is balanced
- insert into appropriate child
- recalculate height after insertion
- when at parent after insertion, compare heights of children
- if child that had insert is now two taller than its sibling, need to rotate
- rotations restore height balance



What Happens In a Rotation?

- involves parent, a child, and a grandchild
- grandchild is where insertion was
- node with middle value ("inner child") becomes parent
- parent will become a child as will other involved node
- subtrees hanging off these will be connected to the balanced node to form the balanced tree

