

CSSE 230 Day 15

AVL insert/Delete Review
AVLTree practice
Worktime

After today, you should be able to...

...write code to insert an item into an EditorTree using rank and keep it balanced

Test summary: recursive tree methods all follow this format

- ▶ Consider an arbitrary method named `foo()`

`foo()`

If base case, return the appropriate value

- 1. Compute a value for the node
 - 2. Call `left.foo()`
 - 3. Call `right.foo()`
 - Combine the results and return them
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- ▶ This is $O(n)$ if the computation on the node is constant-time
 - ▶ When searching in a BST, you only need to recurse left or right, so it is $O(\text{height})$

After insertion into AVL or EditorTree, go up tree, updating balance codes and checking for imbalance

- ▶ p = parent of inserted node
- ▶ while $p \neq \text{null}$
 - // 3 cases (=, tipped towards, tipped away)
 - if $p.\text{balanceCode}$ is '='
 - set code to '/' or '\' (towards insertion point)
 - $p = p.\text{getParent}()$
 - else if $p.\text{balanceCode}$ indicates "insertion was in shorter subtree"
 - change code to '='
 - Break (STOP)
 - else //insertion was into taller side.
 - do the appropriate rotation
 - Break (STOP)

This is for Milestone 1; You will design a similar procedure for deletion (milestone 2)

What is the goal of EditorTrees?

Implementing the List ADT using a balanced tree.

- ▶ **Get/Insert/delete by index**
 - all in $O(\log n)$ time
 - `.add(item)` adds to end
 - `.add(item, index)` adds it to the given index, so the position of the item at that index (and all to the right) increases by 1
- ▶ **Efficient size and height**
 - using rank or maintaining fields
- ▶ **Plus:**
 - Concatenate/Split, like `String +` and `.substring()`

Today's agenda

- ▶ Make sure your whole team has finished and understands yesterday's AVL quiz
 - Get them checked off
- ▶ Work with your team on the project
 - I expect to see you working on paper (designing your algorithms and understanding tests) as much as on the computer
- ▶ If you have completed Milestone 1, you may continue on to Milestone 2.