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Daily Coding Problem #133

Problem

This problem was asked by Amazon.

Given a node in a binary search tree, return the next bigger element, also known as the inorder successor.

For example, the inorder successor of 22 is 30.



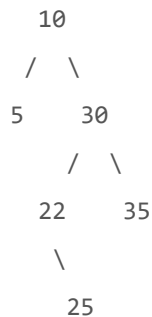
You can assume each node has a parent pointer.

Solution

We can use case-analysis to break the problem down to two steps.

- First, if there is a right child of node, then the leftmost descendant of `node.right` (or just `node.right` if it has none) is simply the inorder successor.
- Otherwise, we can find the inorder successor by traversing through the parent pointers, keeping track of the current node and parent. When we find a parent whose left child is equal to node, then we know this is the inorder successor.

Let's look at an example.



- The inorder successor of 10 is 22 since it has a right child and 22 is the leftmost child of `node.right`.
- The inorder successor of 25 is 30 since 30 is the first parent where `parent.left` is node.

```

class Node:
    def __init__(self, val, left=None, right=None, parent=None):
        self.val = val
        self.left = left
        self.right = right
        self.parent = parent

def inorder_successor(node):
    if node.right:
        return leftmost(node.right)

```

```
parent = node.parent

while parent and parent.left is not node:
    parent, node = parent.parent, parent

return parent

def leftmost(node):
    while node.left:
        node = node.left
    return node
```

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