Is It an AVL

Problem Code: AVL

Design Challenge

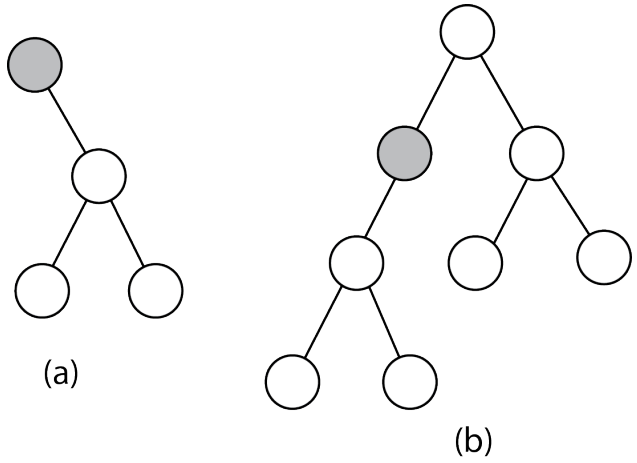
Task Description

AVL tree is a balanced binary search tree (BBST). In this problem, we are interested in AVL's "balance" property.

The height of a tree is defined as the length (number of edges) of the longest simple path from the root to a leaf. Let $height(x)$ be the height of the subtree rooted at node x. The balance factor of x is defined as the difference between the height of x's left subtree and x's right subtree, i.e. $balance(x) = height(x.left) - height(x.right)$.

An AVL tree requires every tree node to have a balance factor among {-1, 0, 1}. That is, for every node x, $balance(x) \in$ {-1, 0, 1}.

The tree in figure (a) is not an AVL because the gray node has balance factor -2. The tree in figure (b) is not an AVL because the gray node has balance factor 2.



You are given a binary tree with n node. You are asked to check whether it satisfies the AVL balance factor constraints.

The nodes of the given tree is numbered from 1 to n. Node 1 is the root node. The tree is described by a parent list, where the i-th element indicates the parent of node i. The first element of the parent list is always zero (node 1 has no parent).

Constraints

$n \geq 1$.

Examples

Case 1: $n = 4$, parent list is $[0, 1, 2, 2]$

Answer: *No*

As illustrated in figure (a)

Case 2: $n = 8$, parent list is $[0, 1, 1, 2, 3, 3, 4, 4]$

Answer: *No*

As illustrated in figure (b)

Case 3: $n = 5$, parent list is $[0, 1, 1, 2, 2]$

Answer: *Yes*

Requirements

Time: $O(n)$ **Space:** $O(n)$