109. Convert Sorted List to Binary Search Tree

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• Depth-first Search + Linked list

Description

Given a singly linked list where elements are sorted in ascending order, convert it to a height balanced BST.

For this problem, a height-balanced binary tree is defined as a binary tree in which the depth of the two subtrees of *every* node never differ by more than 1.

Example:

```
Given the sorted linked list: [-10,-3,0,5,9],

One possible answer is: [0,-3,9,-10,null,5], which represents the following height balanced BST:

0
/\
-3 9
/ /
-10 5
```

1. Thought line

- Height-balanced BST
- $\bullet \hspace{0.4cm}$ Find the middle node in Linked List

```
//find the middle node of linked list
ListNode* dummyHeadLinkList = new ListNode(0);
dummyHeadLinkList->next = nodeList;
ListNode* ptr0 = dummyHeadLinkList;
ListNode* ptr1 = dummyHeadLinkList->next; //mid spot
ListNode* ptr2 = dummyHeadLinkList->next;
while(ptr2 != nullptr && ptr2->next !=nullptr){
   ptr1 = ptr1->next;
   ptr2 = ptr2->next->next;
   ptr0 = ptr0->next;
}
```

• Get left half list and right half list.

```
// first half
ptr0->next = nullptr;
ListNode* firstHalf = dummyHeadLinkList->next;
```

```
// second half
ListNode* secondHalf = ptr1->next;
ptr1->next = nullptr;
```

2. Depth-first Search + Linked list

```
void linkedListRoodFind(ListNode* nodeList, TreeNode* nodeTree, string str = "toRightChild"){
       if (nodeList == nullptr) return;
       ListNode* dummyHeadLinkList = new ListNode(0);
       dummyHeadLinkList->next = nodeList;
       ListNode* ptr0 = dummyHeadLinkList;
       ListNode* ptr1 = dummyHeadLinkList->next; //mid spot
       ListNode* ptr2 = dummyHeadLinkList->next->next;
       while(ptr2 != nullptr && ptr2->next !=nullptr){
           ptr1 = ptr1->next;
           ptr2 = ptr2->next->next;
           ptr0 = ptr0->next;
        ptr0->next = nullptr;
       ListNode* firstHalf = dummyHeadLinkList->next;
       ListNode* secondHalf = ptr1->next;
       ptr1->next = nullptr;
       if (str == "toRightChild"){
           nodeTree->right = new TreeNode(ptr1->val);
           linkedListRoodFind(firstHalf, nodeTree->right, "toLeftChild");
           linkedListRoodFind(secondHalf, nodeTree->right, "toRightChild");
       else if (str == "toLeftChild"){
           nodeTree->left = new TreeNode(ptr1->val);
           linkedListRoodFind(firstHalf, nodeTree->left, "toLeftChild");
           linkedListRoodFind(secondHalf, nodeTree->left, "toRightChild");
class Solution {
   TreeNode* sortedListToBST(ListNode* head) {
       if (head==nullptr) return nullptr;
       TreeNode* dummyHead = new TreeNode(INT_MIN);
       linkedListRoodFind(head,dummyHead);
        return dummyHead->right;
```