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Double Tree

Write a program that converts a given tree to its Double tree. To create Double tree of the given tree, create a new duplicate for each node, and insert the duplicate as the left child of the original node.

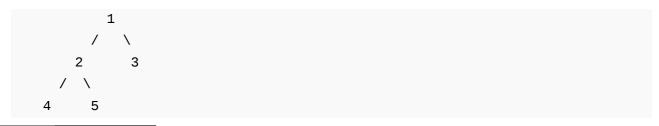
So the tree...

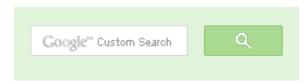
```
2
/\
1 3
```

is changed to...

```
2
/\
2 3
/ /
1 3
/
1
```

And the tree







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is changed to

```
1
             3
 2
           3
5
```

Algorithm:

Recursively convert the tree to double tree in postorder fashion. For each node, first convert the left subtree of the node, then right subtree, finally create a duplicate node of the node and fix the left child of the node and left child of left child.

Implementation:

```
#include <stdio.h>
#include <stdlib.h>
/* A binary tree node has data, pointer to left child
   and a pointer to right child */
struct node
    int data;
    struct node* left;
    struct node* right;
};
/* function to create a new node of tree and returns pointer */
struct node* newNode(int data);
/* Function to convert a tree to double tree */
void doubleTree(struct node* node)
  struct node* oldLeft;
```



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```
if (node==NULL) return;
  /* do the subtrees */
  doubleTree(node->left);
  doubleTree(node->right);
  /* duplicate this node to its left */
  oldLeft = node->left;
  node->left = newNode(node->data);
  node->left->left = oldLeft;
/* UTILITY FUNCTIONS TO TEST doubleTree() FUNCTION */
 /* Helper function that allocates a new node with the
   given data and NULL left and right pointers. */
struct node* newNode(int data)
  struct node* node = (struct node*)
                       malloc(sizeof(struct node));
  node->data = data;
  node->left = NULL;
  node->right = NULL;
  return (node);
/* Given a binary tree, print its nodes in inorder*/
void printInorder(struct node* node)
  if (node == NULL)
    return;
  printInorder(node->left);
  printf("%d ", node->data);
  printInorder(node->right);
/* Driver program to test above functions*/
int main()
  /* Constructed binary tree is
```

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```
struct node *root = newNode(1);
root->left
                  = newNode(2);
root->right
                  = newNode(3);
root->left->left = newNode(4);
root->left->right = newNode(5);
printf("Inorder traversal of the original tree is \n");
printInorder(root);
doubleTree(root);
printf("\n Inorder traversal of the double tree is \n");
printInorder(root);
getchar();
return 0;
```

Time Complexity: O(n) where n is the number of nodes in the tree.

References:

http://cslibrary.stanford.edu/110/BinaryTrees.html

Please write comments if you find any bug in above code/algorithm, or find other ways to solve the same problem.





Recent Comments

affiszerv Your example has two 4s on row 3, that's why it...

Backtracking | Set 7 (Sudoku) · 43 minutes ago

RVM Can someone please elaborate this Qs from above...

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Vishal Gupta I talked about as an Interviewer in general,...

Software Engineering Lab, Samsung Interview | Set

2 · 1 hour ago

@meya Working solution for question 2 of 4f2f round....

Amazon Interview | Set 53 (For SDE-1) · 1 hour ago sandeep void rearrange(struct node *head) {...

Given a linked list, reverse alternate nodes and



Related Tpoics:

- Print a Binary Tree in Vertical Order | Set 2 (Hashmap based Method)
- Print Right View of a Binary Tree
- Red-Black Tree | Set 3 (Delete)
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- Print all nodes at distance k from a given node
- Print a Binary Tree in Vertical Order | Set 1
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- Check if a given Binary Tree is height balanced like a Red-Black Tree









Writing code in comment? Please use ideone.com and share the link here.

17 Comments

GeeksforGeeks

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append at the end · 3 hours ago

Neha I think that is what it should return as,

in...

Find depth of the deepest odd level leaf node · 3

hours ago

AdChoices [>

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- ▶ Tree Trees





Mukunthan • 8 months ago

Correct me if I am wrong.. Here

Postorder works fine if we can add a duplicate node even to left or right Inorder works if a duplicate is added to left

Preorder never works

This is because in "Preorder" and "Right duplicate of Inorder" we create a node which will result in an infinite loop..



code_jazz → Mukunthan • 3 months ago

well u can skip that duplicate node by recursively making calls kike roo preorder fashion



```
pranjalgupta • 10 months ago
```

We can also create a double tree by preorder traversal technique.

```
void preorder(tree* root)
if(root==NULL)
return;
tree* temp=root->left;
root->left=newnode(root->data);
root->left->left=temp;
free(temp);
preorder(root->left->left);
preorder(root->right);
```



```
Nitesh • 10 months ago
  /*Double Tree*/
 node* DoubleTree(node *root)
       if(root == NULL)
         return NULL;
       node *lNode = root->left;
       node *rNode = root->right;
       root->left = newNode(root->data);
       root->left->left = lNode;
       if(lNode != NULL)
         DoubleTree(lNode);
       if(rNode != NULL)
         DoubleTree(rNode);
       return root;
 }
```



abhishek08aug ⋅ a year ago C++ code:

```
#include <iostream>
#include <stdlib.h>
using namespace std;
```

```
class tree_node {
  private:
    int data;
    tree_node * left;
    tree_node * right;
  public:
    tree_node() {
     left=NULL;
     right=NULL;
    }
  void set_data(int data) {
     this->data=data;
```

see more

```
Soumya Sengupta • a year ago
A top-down approch.....
void doubleTree(struct node* node)
struct node* oldLeft;
if (node==NULL) return;
/* do the subtrees */
doubleTree(node->left);
doubleTree(node->right);
/* duplicate this node to its left */
oldLeft = node->left;
node->left = newNode(node->data);
```

node->left->left = oldLeft;

int main()

see more



anantkaushik89 • a year ago

Cant we use preorder here also? I think it should give the same result.

/* Paste your code here (You may **delete** these lines **if not** writing co



Nishant Mishra • 2 years ago

Shouldn't we copy the data field of node to new duplicate node...



Nishant Mishra → Nishant Mishra • 2 years ago

Sorry, about this comment, I didn't see its been passed in Newnode()...



Spock • 2 years ago

The above code is the code for BST. We can do this thing in case of BST by a

I don't know there is some problem with the site so sometimes the code just v



GeeksforGeeks → Spock · 2 years ago

@Spock: Apologies for the trouble. If your comment doesn't appear im moderation by spam checker tool. Our admins manually approve such 

Spock • 2 years ago

Well in case of BST we can simply do this thing with the help of inorder travers same, please tell if it has some shortcomings.

```
#include<stdio.h>
#include<stdlib.h>

struct node {
    long int data;
    struct node *left;
    struct node *right;
};

struct node *newnode(long int dat) {
    struct node *newone = malloc(sizeof(struct node));
    newone->data = dat;
    newone->left = NULL;
    newone->right = NULL;
    return newone;
```

see more



Spock • 2 years ago

Well in case of BST we can do this just by the inorder traversal of the tree.

Here is the code which uses the inorder traversal of the BST.

Please point out if it has any shortcomings.

#include<stdio.h>

```
#include<stdlib.h>

struct node {
    long int data;
    struct node *left;
    struct node *right;
};

struct node *newnode(long int dat) {
    struct node *newone = malloc(sizeof(struct node));
    newone->data = dat;
    newone->left = NULL;
```

see more

```
k53 • 2 years
```



```
nptr ins_left(nptr root)
{
    if(root==NULL)// boundary check for empty tree
        return NULL;
    if(root->left != NULL) // Left child present
    {
        nptr save;
        save=root->left; // save left child
        root->left=makeNode(root->data); // dup and insert left
        root->left->left=ins_left(save); // recurse with old if
    }
    else //no left child
        root->left=makeNode(root->data); // dup and ins left
    if(root->right != NULL)// right child present
Are you a developer? Try out the HTML to PDF API
```

```
root->right=ins_left(root->right); // recursively app.
        //else -no right child - do nothing
          return root;
Sunil · 3 years ago
void convertToDouble(struct node* root)
struct node* temp,*new;
if(root!=NULL)
convertToDouble(root->llink);
temp=root->llink;
new=(struct node*)malloc(sizeof(struct node));
new->info=root->info;
new->llink=temp;
new->rlink=NULL;
root->llink=new;
convertToDouble(root->rlink);

✓ • Reply • Share ›
neeraj singh • 3 years ago
  public static void duplicateTheTree(Node n) {
          if (n==null) {
              return;
```

```
Mode dup - Hem Mode(Hivatae),
     duplicateTheTree(n.left);
     duplicateTheTree(n.right);
     dup.left = n.left;
     n.left = dup;
Reply • Share >
  Sangeeta → neeraj singh · 2 years ago
  nice:)
    /* Paste your code here (You may delete these lines if not writ
  1 ^ | V · Reply · Share >
```

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