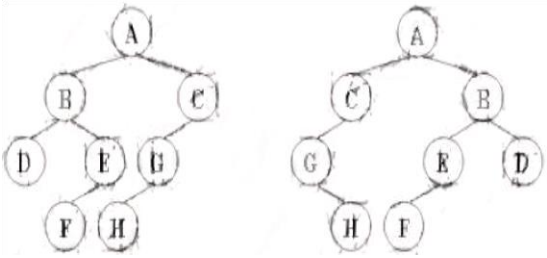
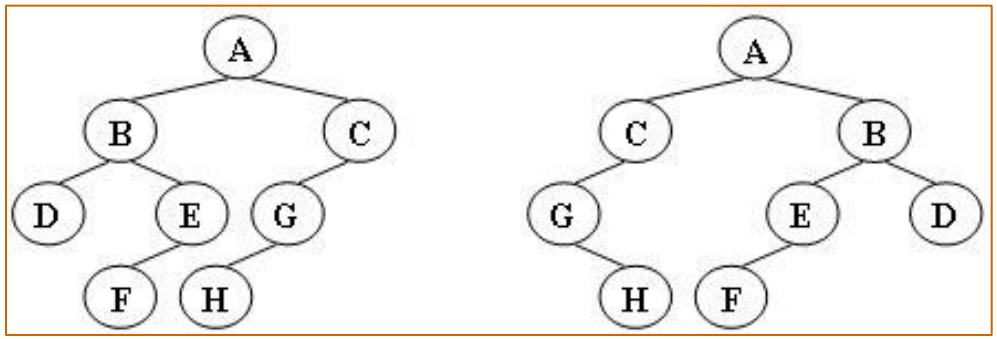
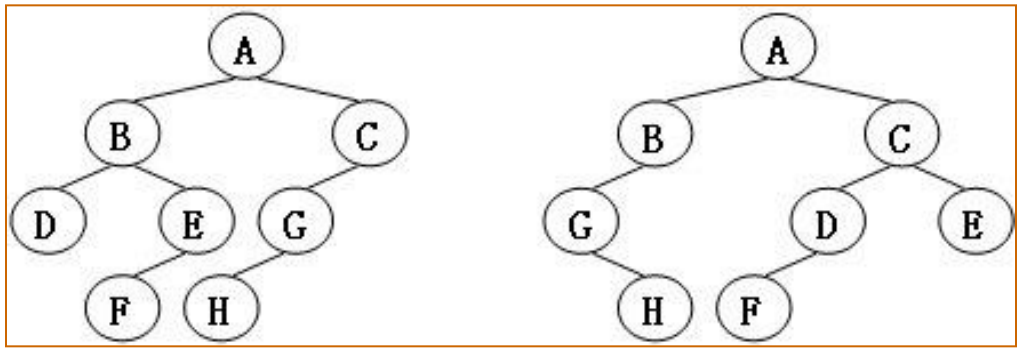
小白专场： 树的同构



题意理解

给定两棵树T1和T2。如果T1可以通过若干次左右孩子互换就变成T2，则我们称两棵树是“同构”的。
现给定两棵树，请你判断它们是否是同构的。





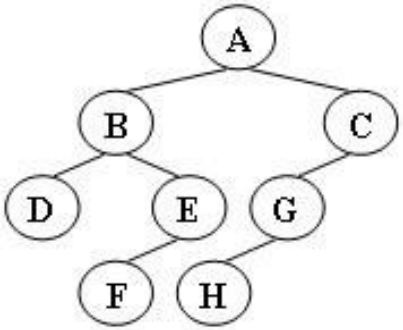
题意理解

输入格式: 输入给出2棵二叉树的信息:

- 先在一行中给出该树的结点数，随后N行
- 第i行对应编号第i个结点，给出该结点中存储的字母、其左孩子结点的编号、右孩子结点的编号。
- 如果孩子结点为空，则在相应位置上给出“-”。

输入样例:

```
8
0 A 1 2
1 B 3 4
2 C 5 -
3 D - -
4 E 6 -
5 G 7 -
6 F - -
7 H - -
8
G - 4
B 7 6
F - -
A 5 1
H - -
C 0 -
D - -
E 2 -
```



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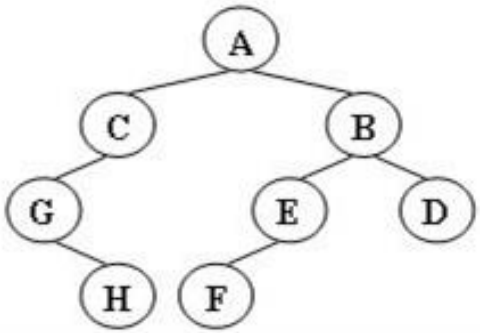
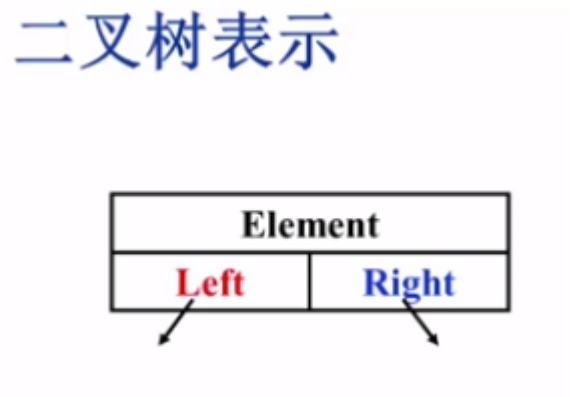
2 F - -
3 A 5 1
4 H - -
5 C 0 -
6 D - -
7 E 2 -
```

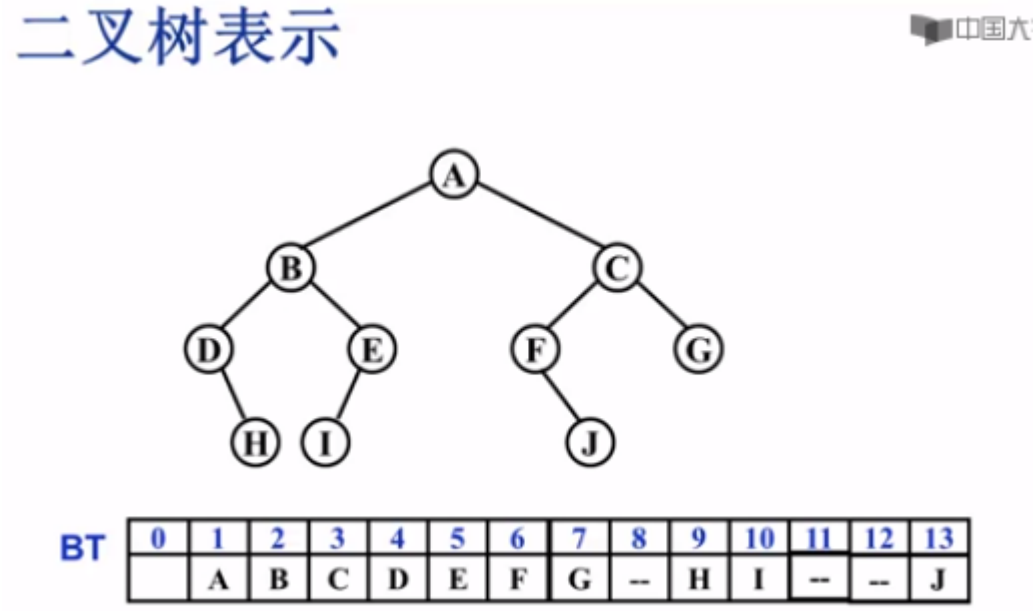


求解思路

1. 二叉树表示
2. 建二叉树
3. 同构判别

二叉树表示





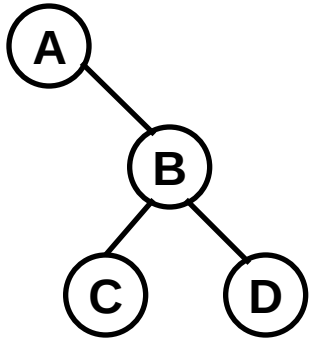
二叉树表示

结构数组表示二叉树：静态链表

物理上存储是数组，思想是链表思想=》称为静态链表

```
#define MaxTree 10
#define ElementType char
#define Tree int
#define Null -1

struct TreeNode
{
        ElementType Element;
        Tree  Left;
        Tree  Right;
} T1[MaxTree], T2[MaxTree];
```



	A	B	C	D	
Left	-1	2	-1	-1	
Right	1	3	-1	-1	
	0	1	2	3	4

二叉树表示

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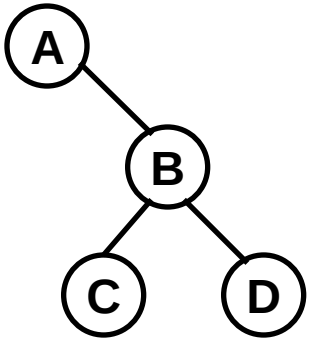

	0	1	2	3	4
	B	A		D	C
Left	4	-1		-1	-1
Right	3	0		-1	-1

程序框架搭建

```
int main()
{
    建二叉树1
    建二叉树2
    判别是否同构并输出

    return 0;
}
```

需要设计的函数：

- 读数据建二叉树
- 二叉树同构判别

```
int main()
{
   Tree R1, R2;

    R1 = BuildTree(T1);
    R2 = BuildTree(T2);
    if (Isomorphic(R1, R2))  printf("Yes\n");
    else  printf("No\n");

    return 0;
}
```

写程序首先写出程序框架 -> 判断需要设计的函数 ->

如何建二叉树

```
   8
0  A 1 2
1  B 3 4
2  C 5 -
3  D - -
4  E 6 -
5  G 7 -
6  F - -
7  H - -
```

```
Tree BuildTree( struct TreeNode T[] )
{
        .....
        scanf("%d\n", &N);
        if (N) {
                ........
                for (i=0; i<N; i++) {
                        scanf("%c %c %c\n", &T[i].Element, &cl, &cr);
                        ......
                }
                ......

                Root = ???
        }
        return Root;
}
```

T[i]中没有任何结点的left(cl)和right(cr)指向它。只有一个

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如何建二叉树

```
Tree BuildTree( struct TreeNode T[] )
{
        .....
        scanf("%d\n", &N);
        if (N) {
                for (i=0; i<N; i++) check[i] = 0;
                for (i=0; i<N; i++) {
                        scanf("%c %c %c\n", &T[i].Element, &cl, &cr);
                        if (cl != '-') {
                                T[i].Left = cl-'0';
                                check[T[i].Left] = 1;
                        }
                        else T[i].Left = Null;
                        ........    /*对cr的对应处理 */
                }
                for (i=0; i<N; i++)
                        if (!check[i]) break;
                Root = i;
        }
        return Root;
}
```

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如何判别两二叉树同构

```
int  Isomorphic ( Tree R1, Tree R2 )
{
     if  ( (R1==Null )&& (R2==Null) )  /* both empty */
                    return  1;
     if  ( ((R1==Null)&&(R2!=Null)) || ((R1!=Null)&&(R2==Null)) )
                    return  0;  /* one of them is empty */
     if  ( T1[R1].Element != T2[R2].Element )
                    return  0;  /* roots are different */
     if  ( ( T1[R1].Left == Null )&&( T2[R2].Left == Null ) )
                                 /* both have no left subtree */
                    return  Isomorphic( T1[R1].Right, T2[R2].Right );
     ……
}
```

如何判别两二叉树同构

```
int  Isomorphic ( Tree R1, Tree R2 )
{       ……
        if  ( ((T1[R1].Left!=Null)&&(T2[R2].Left!=Null))&&
              ((T1[T1[R1].Left].Element)==(T2[T2[R2].Left].Element)) )
          /* no need to swap the left and the right */
                  return  ( Isomorphic( T1[R1].Left, T2[R2].Left ) &&
                            Isomorphic( T1[R1].Right, T2[R2].Right ) );

        else   /* need to swap the left and the right  */
                  return ( Isomorphic( T1[R1].Left, T2[R2].Right) &&
                            Isomorphic( T1[R1].Right, T2[R2].Left ) );
}
```