G. H. Raisoni College Of Engineering And Management, Wagholi Pune

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Assignment no :- 6

Department	CE [SUMMER 2022 (Online)]		
Term / Section	III/B	Date Of **submission**	12-12-2021
Subject Name /Code	Data Structures and Algorithms/ UCSL201/UCSP201		
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Experiment No 6

Aim :→ A book conist of chapters. chapters consist of sections and Sections consist of Subsections. Construct a tree and print the nodes. Find the time and space requirements of your method

Theory :→

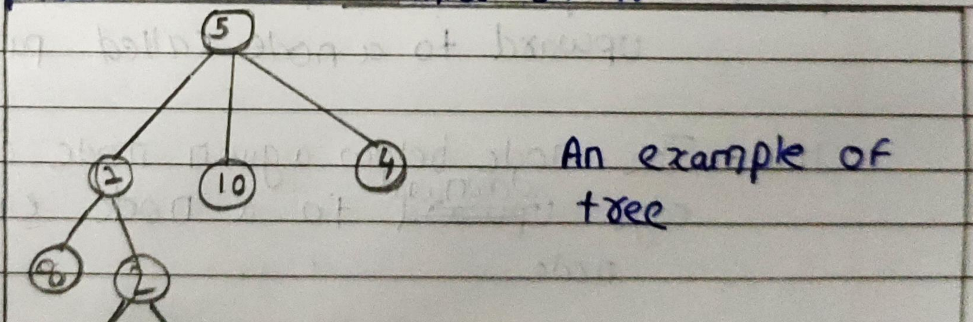
Introduction to trees:

Defⁿ :→

- A tree 'T' is a set of nodes Storing elements Such that the nodes have a parent-Child relation Ship that satisfies the following

- if T is not empty, T has a special tree called the root that has no parent

- each node V of T different than the root has a unique parent node w; each node with parent W is a child of W



An example of tree

An internal node or inner node is any node of a Tree that has child nodes and is thus not a leaf node.

There are two basic types of trees. In an unordered tree that has child nodes and it a tree is a tree in a purely structural sense that is to say, given a node, there is no order for the children of that node. A tree on which an order is imposed - for example, by assigning different natural numbers to each child of each node - is called an ordered tree and data structures built on them are called ordered tree data structure.

Important terms

Path - Path refers to the sequence of nodes along the edges of a tree.

Root - The node at the top of the tree is called root. There is only one root per tree and one path from the root node to any node.

parent - Any node except the root has one edge upward to a node called parent

Child - The node below a given node connected by its edge ~~upward~~ downward to a node called its child node.

Leaf - The node which does not have any child node is called the leaf node.

~~Subs~~ Subtree - subtree represents the descendants of a node visiting - visiting refers to checking the values of a node when control is on the node

Traversing - Traversing means passing through nodes in a specific order.

Levels - Level of a node represents the generation of a node. If the root node is at level 0, then its next child node is at level 1, its grandchild is at level 2, and so on.

keys - key represents a value of a node based on which a search operation is to be carried out for a node.

Advantages of tree

- Trees reflect structural relationships in the data
- Trees are used to represent hierarchies
- Trees provide an efficient insertion and Searching
- Tree are very flexible data.

~~Recursive definition~~.

Input :- Book name & its number of sections and sub sections along with name.

Output :→ Formation of tree structure for book and its section

Conclusion :→ This program gives us the knowledge tree data structure.

Program code :-

```
#include <iostream>
#include <cstdlib>
#include <string.h>
using namespace std;
/*
 * Node Declaration
 */
struct node
{
   char label[10];
   int ch_count;
   struct node *child[10];
} * root;

/*
 * Class Declaration
 */
class BST
{
public:
   void create_tree();
   void display(node *r1);

   BST()
   {
      root = NULL;
   }
};
```

```cpp
void BST::create_tree()
{
    int tbooks, tchapters, i, j, k;
    root = new node();
    cout << "Enter name of book : ";
    cin >> root->label;
    cout << "Enter no. of chapters in book : ";
    cin >> tchapters;
    root->ch_count = tchapters;
    for (i = 0; i < tchapters; i++)
    {
        root->child[i] = new node;
        cout << "Enter Chapter name : ";
        cin >> root->child[i]->label;
        cout << "Enter no. of sections in  Chapter : " << root->child[i]->label<<" : ";
        cin >> root->child[i]->ch_count;
        for (j = 0; j < root->child[i]->ch_count; j++)
        {
            root->child[i]->child[j] = new node;
            cout << "Enter Section : " << j + 1 << " Name\n";
            cin >> root->child[i]->child[j]->label;
            // cout<<"Enter no. of subsections in "<<r1->child[i]->child[j]->label;
            // cin>>r1->child[i]->ch_count;
        }
    }
}

void BST::display(node *r1)
```

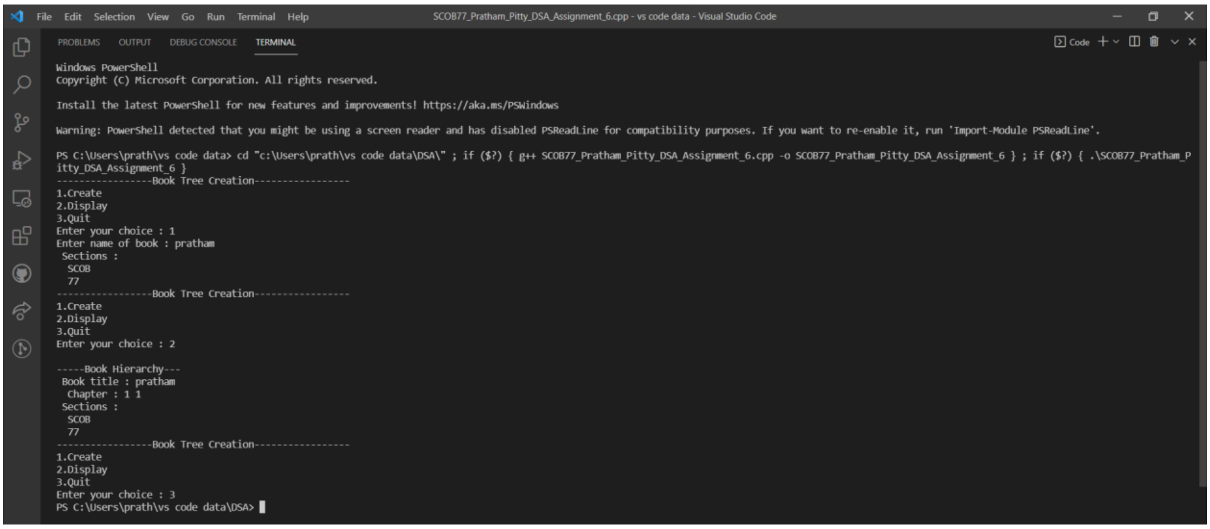
```
{
    int i, j, k, tchapters;
    if (r1 != NULL)
    {
        cout << "\n-----Book Hierarchy---";

        cout << "\n Book title : " << r1->label;
        tchapters = r1->ch_count;
        for (i = 0; i < tchapters; i++)
        {

            cout << "\n  Chapter : " << i + 1;
            cout << " " << r1->child[i]->label;
            cout << "\n Sections : ";
            for (j = 0; j < r1->child[i]->ch_count; j++)
            {
                // cin>>r1->child[i]->child[j]->label;
                cout << "\n  " << r1->child[i]->child[j]->label;
            }
            cout<<endl;
        }
    }
}

/*
 * Main Contains Menu
 */
int main()
{
    int choice;
    BST bst;
    while (1)
    {
        cout << "-----------------Book Tree Creation-----------------" << endl;
        cout << "1.Create\n2.Display\n3.Quit" << endl;
        cout << "Enter your choice : ";
        cin >> choice;
        switch (choice)
        {
        case 1:
            bst.create_tree();
        case 2:
            bst.display(root);
            break;
        case 3:
            exit(1);
        default:
            cout << "Wrong choice " << endl;
        }
    }
}
```

<u>Output :-</u>



File Edit Selection View Go Run Terminal Help
SCOB77_Pratham_Pitty_DSA_Assignment_6.cpp - vs code data - Visual Studio Code
PROBLEMS
OUTPUT
DEBUG CONSOLE
TERMINAL
Code

```
Windows PowerShell
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Install the latest PowerShell for new features and improvements! https://aka.ms/PSWindows

Warning: PowerShell detected that you might be using a screen reader and has disabled PSReadLine for compatibility purposes. If you want to re-enable it, run 'Import-Module PSReadLine'.

PS C:\Users\prath\vs code data> cd "c:\Users\prath\vs code data\DSA\" ; if ($?) { g++ SCOB77_Pratham_Pitty_DSA_Assignment_6.cpp -o SCOB77_Pratham_Pitty_DSA_Assignment_6 } ; if ($?) { .\SCOB77_Pratham_P
itty_DSA_Assignment_6 }
-----------------Book Tree Creation----------------
1.Create
2.Display
3.Quit
Enter your choice : 1
Enter name of book : pratham
 Sections :
  SCOB
  77
-----------------Book Tree Creation----------------
1.Create
2.Display
3.Quit
Enter your choice : 2

-----Book Hierarchy---
 Book title : pratham
  Chapter : 1 1
 Sections :
  SCOB
  77
-----------------Book Tree Creation----------------
1.Create
2.Display
3.Quit
Enter your choice : 3
PS C:\Users\prath\vs code data\DSA> █
```