Skill Development Lab-II (2018-2019)

BRACT’s
VISHWAKARMA INSTITUTE OF INFORMATION TECHNOLOGY, PUNE – 48
An Autonomous Institute Affiliated to Savitribai Phule Pune University, Pune

SD(LP-II) ASSIGNMENT (S.Y.B. Tech. – DIV: C)

Name: Prathamesh Gaikwad;
Roll no.: 223019;
GR. No.: 17u416; Batch: C1

Assignment 2:

Aim :

Construct a threaded binary search tree by inserting values in the given order and traverse it in inorder traversal using threads.

Objective :

We have to implement threaded binary search tree using BST data structure.

Theory : Inorder traversal of a Binary tree can either be done using recursion or with the use of a auxiliary stack . The idea of threaded binary trees is to make inorder traversal faster and do it without stack and without recursion. A binary tree is made threaded by making all right child pointers that would normally be NULL point to the inorder successor of the node (if it exists).

Applications :

Threaded binary can be used where stack space is limited. Threaded binary is used where fastest traversal is the main requirement .

ALGORITHM:

Non recursive Inorder traversal for a Threaded Binary Tree

1. curr-node node leftmost (root)

```
 2. While (curr_node != Null)
      a. print (curr_node)
      b. If (curr_node.RTag == 0) then
             curr_node <- curr_node.right
             go to step 2.
      c. else    curr_node <- leftmost(curr_node.right)
             go to step 2.
```

Program :

```
#include<iostream>
using namespace std;
class TBT
{
int data;
int lth,rth;
TBT *lptr,*rptr;
public:
void Create(int);
void Insert(TBT*,TBT*);
void Display_inorder(TBT*);
}*root=NULL,*headnode;

void TBT::Create(int y)
```

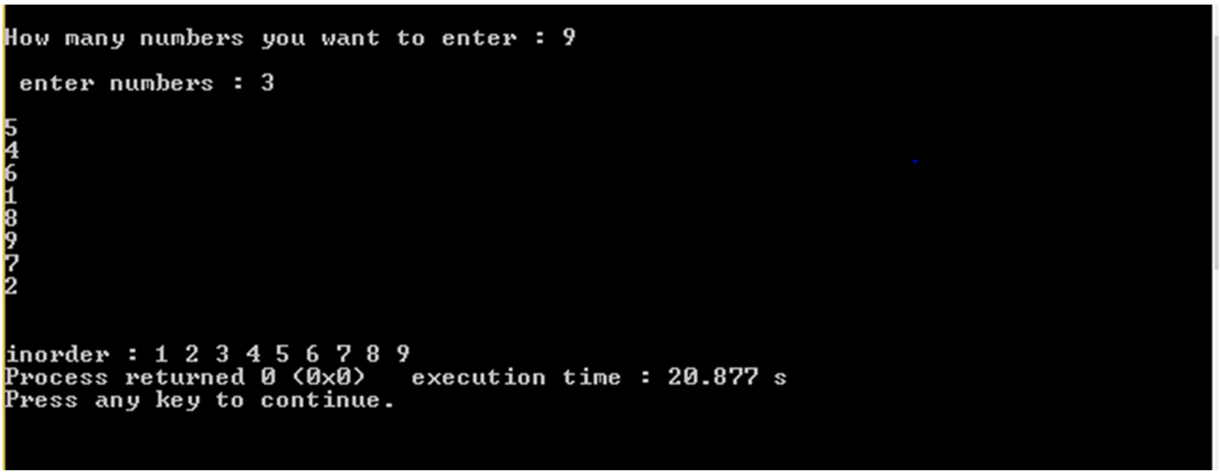
```
{
TBT *nn=new TBT;
nn->data=y;
nn->lptr=nn->rptr=NULL;
nn->lth=nn->rth=1;      //1=thread
if(root==NULL)
{
root=nn;
headnode=new TBT;
headnode->data=0;
headnode->lptr=root;
headnode->rptr=headnode;
headnode->lth=headnode->rth=1;
root->lptr=root->rptr=headnode;
}
else
Insert(root,nn);
}
void TBT::Insert(TBT* temp, TBT* nn)
{
if(nn->data<temp->data)
{
```

```
if(temp->lth==1)
{
nn->lptr=temp->lptr;      //nn->lptr pointing to headnode
temp->lptr=nn;
nn->rptr=temp;
temp->lth=0;
}
else Insert(temp->lptr,nn);
}
else if(nn->data>temp->data)
{
if(temp->rth==1)
{
nn->rptr=temp->rptr;     //nn->rptr pointing to headnode
temp->rptr=nn;
nn->lptr=temp;
temp->rth=0;
}
else Insert(temp->rptr,nn);
}}
void TBT::Display_inorder(TBT* head)
{
```

```
TBT *current;
current=head->lptr;
while(current->lth!=1)
   current=current->lptr;
while(current!=head)
{
   cout<<current->data<<" ";
   if(current->rth==1)
      current=current->rptr;
   else
   {
      current=current->rptr;
      while(current->lth==0)
         current=current->lptr;
   }
}
}
int main()
{
TBT t;
int i,z,y;
cout<<endl<<"How many numbers you want to enter : ";cin>>z;
```

```
cout<<"\n enter numbers : ";
i=0;
while(i<z)
{
cin>>y;
t.Create(y);
i++;
}
cout<<endl<<"\ninorder : ";
t.Display_inorder(headnode);
return 0;
}
```

Output :



```
How many numbers you want to enter : 9

 enter numbers : 3

5
4
6
1
8
9
7
2


inorder : 1 2 3 4 5 6 7 8 9
Process returned 0 (0x0)   execution time : 20.877 s
Press any key to continue.
```

Conclusion : Thus we have studied threaded binary search tree using BST data structure.