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Data Structure and Algorithms

Lab Report

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Experiment # 3

Stack with Array implementation

Objective

The objective of this session is to understand the various operations on stack using arrays structure in C++.

Software Tool

1. Dev C++

1 Theory

Stacks are the most important in data structures. The notation of a stack in computer science is the same as the notion of the Stack to which you are accustomed in everyday life. For example, a recursion program on which function call itself, but what happen when a function which is calling itself call another function. Such as a function A call function B as a recursion. So, the firstly function B is call in A and then function A is work. So, this is a Stack. This is a Stack is First in Last Out data structure.

Insertions in Stack:

In Stacks, we know the array work, sometimes we need to modify it or add some element in it. For that purpose, we use insertion scheme. By the use of this scheme we insert any element in Stacks using array. In Stack, we maintain only one node which is called TOP. And Push terminology is used as insertions.

Deletion in Stack:

In the deletion process, the element of the Stack is deleted on the same node which is called TOP. In stacks, its just deleting the index of the TOP element which is added at last. In Stacks Pop terminology is used as deletion.

Display of Stack: In displaying section, the elements of Stacks are being display by using loops and variables as a reverse order. Such that, last element is display at on first and first element enters display at on last.

Algorithm for top of stack varying method :

1. Declare and initialize necessary variables, eg top = -1, MAXSIZE etc.
2. For push operation, if top = MAXSIZE - 1 print "stack overflow" else top = top + 1; Read item from user stack[top] = item
3. For next push operation, goto step 2
4. For pop operation, If top = -1 print "Stack underflow" Else item = stack[top] top = top - 1 Display item
5. For next pop operation, goto step 4.
6. Stop

2 Lab Task

1. Insertion in stack
2. Deletion in stack
3. Display the stack

2.1 Program:

```
#include<iostream>
#define MAX 5

using namespace std;

int STACK[MAX],TOP;

//stack initialization
void initStack(){
    TOP=-1;
}
//check it is empty or not
int isEmpty(){
    if(TOP==-1)
```

```

        return 1;
    else
        return 0;
}

//check stack is full or not
int isFull(){
    if(TOP==MAX-1)
        return 1;
    else
        return 0;
}

void push(int num){
    if(isFull()){
        cout<<"STACK is FULL."<<endl;
        return;
    }
    ++TOP;
    STACK[TOP]=num;
    cout<<num<<" has been inserted."<<endl;
}

void display(){
    int i;
    if(isEmpty()){
        cout<<"STACK is EMPTY."<<endl;
        return;
    }
    for(i=TOP; i>=0; i--){
        cout<<STACK[i]<<" ";
    }
    cout<<endl;
}

//pop - to remove item
void pop(){
    int temp;
    if(isEmpty()){
        cout<<"STACK is EMPTY."<<endl;

```

```

        return;
    }

    temp=STACK[TOP];
    TOP--;
    cout<<temp<<" _has _been _deleted ."<<endl;
}
int main(){
    int num;
    initStack();
    char ch;
    do{
        int a;
        cout<<" Chosse _\n1. push\n"<<" 2. pop\n"<<" 3. display\n";
        cout<<" Please _enter _your _choice: _";
        cin>>a;
        switch(a)
        {
            case 1:
                cout<<" Enter _an _Integer _Number: _";
                cin>>num;
                push(num);
                break;

            case 2:
                pop();
                break;

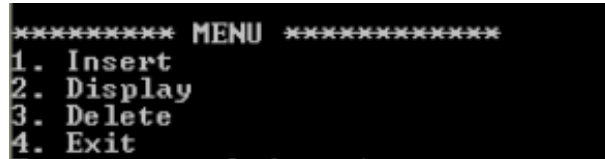
            case 3:
                display();
                break;

            default :
                cout<<" An _Invalid _Choice !!!\n";

        }
        cout<<" Do _you _want _to _continue _? _";
        cin>>ch;
    }while(ch=='Y' || ch=='y');
}

```

```
    return 0;  
}
```



```
***** MENU *****  
1. Insert  
2. Display  
3. Delete  
4. Exit
```

Figure : 1 Output

3 Conclusion

Stack is an abstract data type with a bounded(predefined) capacity. It is a simple data structure that allows adding and removing elements in a particular order. Every time an element is added, it goes on the top of the stack and the only element that can be removed is the element that is at the top of the stack, just like a pile of objects.