ECU

SET123: Data Structure and Algorithms

Project 1 (Towers of Hanoi)

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USING STACK :

stack.h

```cpp
#pragma once
class stack
{
private:
int top = -1;
char arr[27];
public:
void push(char x);
char pop();
void display(int y);
};
```

stack.cpp

```cpp
#include "stack.h"
#include<iostream>
using namespace std;
void stack::push(char x)
{
top++;
arr[top] = x;
}
char stack::pop()
{
return arr[top--];
}
void stack::display(int y)
{
cout << "*****************************************************" << endl;
cout << "|||" << y + 1 << " ------> ";
for (int i = 0; i <= top; i++)
cout << arr[i] << " ";
cout << endl;
}
```

```cpp
#include<iostream>
#include"stack.h"
using namespace std;
void movements(int ring, int FristTower, int ThirdTower, int SecondTower);
void Graphical();
stack t[3];
void main()
{
char Ring[27] = " ABCDEFGHIJKLMNOPQRSTVWXYZ";
int number;
cout << "please enter the number of disks : ";
cin >> number;cout << endl;
for (int i = number; i > 0; i--)
{
t[0].push(Ring[i]);
}
cout << "------Before making the moves------" << endl << endl;
Graphical();
cout << "------while making movements------" << endl << endl;
movements(number, 1, 3, 2);
cout << "------After making the moves------" << endl << endl;
Graphical();
}
void movements(int ring, int FristTower, int ThirdTower, int SecondTower)
{
if (ring == 1)
{
cout << "Move the ring from " << FristTower << " to " << ThirdTower << endl;
t[ThirdTower - 1].push(t[FristTower - 1].pop());
Graphical();
}
else
{
movements(ring - 1, FristTower, SecondTower, ThirdTower);
cout << "Move the ring from " << FristTower << " to " << ThirdTower << endl;
t[ThirdTower - 1].push(t[FristTower - 1].pop());
Graphical();
movements(ring - 1, SecondTower, ThirdTower, FristTower);
}
}
void Graphical()
{
for (int i = 0; i < 3; i++)
t[i].display(i);
cout << "*****************************************************" << endl << endl;
}
```

```
please enter the number of disks : 3

------Before making the moves------

***********************************************
|||1 ------> C B A
***********************************************
|||2 ------>
***********************************************
|||3 ------>
***********************************************

------while making movements------

Move the ring from 1 to 3
***********************************************
|||1 ------> C B
***********************************************
|||2 ------>
***********************************************
|||3 ------> A
***********************************************

Move the ring from 1 to 2
***********************************************
|||1 ------> C
***********************************************
|||2 ------> B
***********************************************
|||3 ------> A
***********************************************

Move the ring from 3 to 2
***********************************************
|||1 ------> C
***********************************************
|||2 ------> B A
***********************************************
|||3 ------>
***********************************************

Move the ring from 1 to 3
***********************************************
|||1 ------>
***********************************************
|||2 ------> B A
***********************************************
|||3 ------> C
***********************************************

Move the ring from 2 to 1
***********************************************
|||1 ------> A
***********************************************
|||2 ------> B
***********************************************
|||3 ------> C
***********************************************

Move the ring from 2 to 3
***********************************************
|||1 ------> A
***********************************************
|||2 ------>
***********************************************
|||3 ------> C B
***********************************************

Move the ring from 1 to 3
***********************************************
|||1 ------>
***********************************************
|||2 ------>
***********************************************
|||3 ------> C B A
***********************************************

------After making the moves------

***********************************************
|||1 ------>
***********************************************
|||2 ------>
***********************************************
|||3 ------> C B A
***********************************************

C:\Users\Mohamed\source\repos\Project_stack\x64\Debug\Project_stack.exe (process 13116) exited with code 0.
To automatically close the console when debugging stops, enable Tools->Options->Debugging->Automatically close the console when debugging stops.
Press any key to close this window . . .
```

USING RECURSION :

tower_of_hanoi.h

```cpp
#pragma once
class tower_of_hanoi
{
private:
int ring;
char FristTower;
char SecondTower;
char ThirdTower;
public:
void hanoi(int ring, char
FristTower, char
ThirdTower, char
SecondTower);
};
```

tower_of_hanoi.cpp

```cpp
#include<iostream>
using namespace std;
#include "tower_of_hanoi.h"
void tower_of_hanoi :: hanoi(int ring, char FristTower, char ThirdTower, char SecondTower)
{
if (ring == 1)
{
cout << "Move the ring number " << ring << " from " << FristTower << " to " << ThirdTower << endl;
}
else
{
hanoi(ring - 1, FristTower, SecondTower, ThirdTower);
cout << "Move the ring number " << ring << " from " << FristTower << " to " << ThirdTower << endl;
hanoi(ring - 1, SecondTower, ThirdTower, FristTower);
}
}
```

Source.cpp

```cpp
#include <iostream>
#include"tower_of_hanoi.h"
using namespace std;
void main()
{
int n;
char first, second, third;
tower_of_hanoi t;
cout << "please enter the number of rings : ";            cin >> n;
cout << endl << "please enter the name of first tower : ";    cin >> first;
cout << endl << "please enter the name of second tower : ";   cin >> second;
cout << endl << "please enter the name of third tower : ";    cin >> third;
cout << endl << "---------------movements---------------" << endl;
t.hanoi(n, first, third, second);
}
```

```
please enter the number of rings : 6

please enter the name of first tower : A

please enter the name of second tower : B

please enter the name of third tower : C

---------------movements---------------
Move the ring number 1 from A to B
Move the ring number 2 from A to C
Move the ring number 1 from B to C
Move the ring number 3 from A to B
Move the ring number 1 from C to A
Move the ring number 2 from C to B
Move the ring number 1 from A to B
Move the ring number 4 from A to C
Move the ring number 1 from B to C
Move the ring number 2 from B to A
Move the ring number 1 from C to A
Move the ring number 3 from B to C
Move the ring number 1 from A to B
Move the ring number 2 from A to C
Move the ring number 1 from B to C
Move the ring number 5 from A to B
Move the ring number 1 from C to A
Move the ring number 2 from C to B
Move the ring number 1 from A to B
Move the ring number 3 from C to A
Move the ring number 1 from B to C
Move the ring number 2 from B to A
Move the ring number 1 from C to A
Move the ring number 4 from C to B
Move the ring number 1 from A to B
Move the ring number 2 from A to C
Move the ring number 1 from B to C
Move the ring number 3 from A to B
Move the ring number 1 from C to A
Move the ring number 2 from C to B
Move the ring number 1 from A to B
Move the ring number 6 from A to C
Move the ring number 1 from B to C
Move the ring number 2 from B to A
Move the ring number 1 from C to A
Move the ring number 3 from B to C
Move the ring number 1 from A to B
Move the ring number 2 from A to C
Move the ring number 1 from B to C
Move the ring number 4 from B to A
Move the ring number 1 from C to A
Move the ring number 2 from C to B
Move the ring number 1 from A to B
Move the ring number 3 from C to A
Move the ring number 1 from B to C
Move the ring number 2 from B to A
Move the ring number 1 from C to A
Move the ring number 5 from B to C
Move the ring number 1 from A to B
Move the ring number 2 from A to C
Move the ring number 1 from B to C
Move the ring number 3 from A to B
Move the ring number 1 from C to A
Move the ring number 2 from C to B
Move the ring number 1 from A to B
Move the ring number 4 from A to C
Move the ring number 1 from B to C
Move the ring number 2 from B to A
Move the ring number 1 from C to A
Move the ring number 3 from B to C
Move the ring number 1 from A to B
Move the ring number 2 from A to C
Move the ring number 1 from B to C

C:\Users\Mohamed\source\repos\Project1\x64\Debug\Project1.exe (process 21452) exited with code 0.
To automatically close the console when debugging stops, enable Tools->Options->Debugging->Automatically close the console when debugging stops.
Press any key to close this window . . .
```

THANK YOU...