Assignment 3

Tower Of Hanoi

https://github.com/mmujtaba25/CS-110

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Overview of requirements

Source Code:

A working example of Tower of Hanoi, that prints the move sequence to solve the game. The program should work for **5** disks. The program should be done **recursively**.

Source Code Requirements:

- Implementation of Function:

```
void hanoi(int n, char from, char to, char aux);
```

Trace:

A detailed trace of the recursive calls showing the order in which calls are made and completed.

Screenshots of program output:

For 5 Disks

```
obscure@Obscures-MacBook-Air output % ./"source"
Move disk <1> from <A> to <C>
Move disk <2> from <A> to <B>
Move disk <1> from <C> to <B>
Move disk <3> from <A> to <C>
Move disk <1> from <B> to <A>
Move disk <2> from <B> to <C>
Move disk <1> from <A> to <C>
Move disk <4> from <A> to <B>
Move disk <1> from <C> to <B>
Move disk <2> from <C> to <A>
Move disk <1> from <B> to <A>
Move disk <3> from <C> to <B>
Move disk <1> from <A> to <C>
Move disk <2> from <A> to <B>
Move disk <1> from <C> to <B>
Move disk <5> from <A> to <C>
Move disk <1> from <B> to <A>
Move disk <2> from <B> to <C>
Move disk <1> from <A> to <C>
Move disk <3> from <B> to <A>
Move disk <1> from <C> to <B>
Move disk <2> from <C> to <A>
Move disk <1> from <B> to <A>
Move disk <4> from <B> to <C>
Move disk <1> from <A> to <C>
Move disk <2> from <A> to <B>
Move disk <1> from <C> to <B>
Move disk <3> from <A> to <C>
Move disk <1> from <B> to <A>
Move disk <2> from <B> to <C>
Move disk <1> from <A> to <C>
obscure@Obscures-MacBook-Air output %
```

For 3 Disks

```
obscure@Obscures-MacBook-Air output % ./"source"
Move disk <1> from <A> to <C>
Move disk <2> from <A> to <B>
Move disk <1> from <C> to <B>
Move disk <3> from <A> to <C>
Move disk <1> from <B> to <A>
Move disk <2> from <B> to <C>
Move disk <1> from <A> to <C>
obscure@Obscures-MacBook-Air output %
```

Trace document (Annex-I):

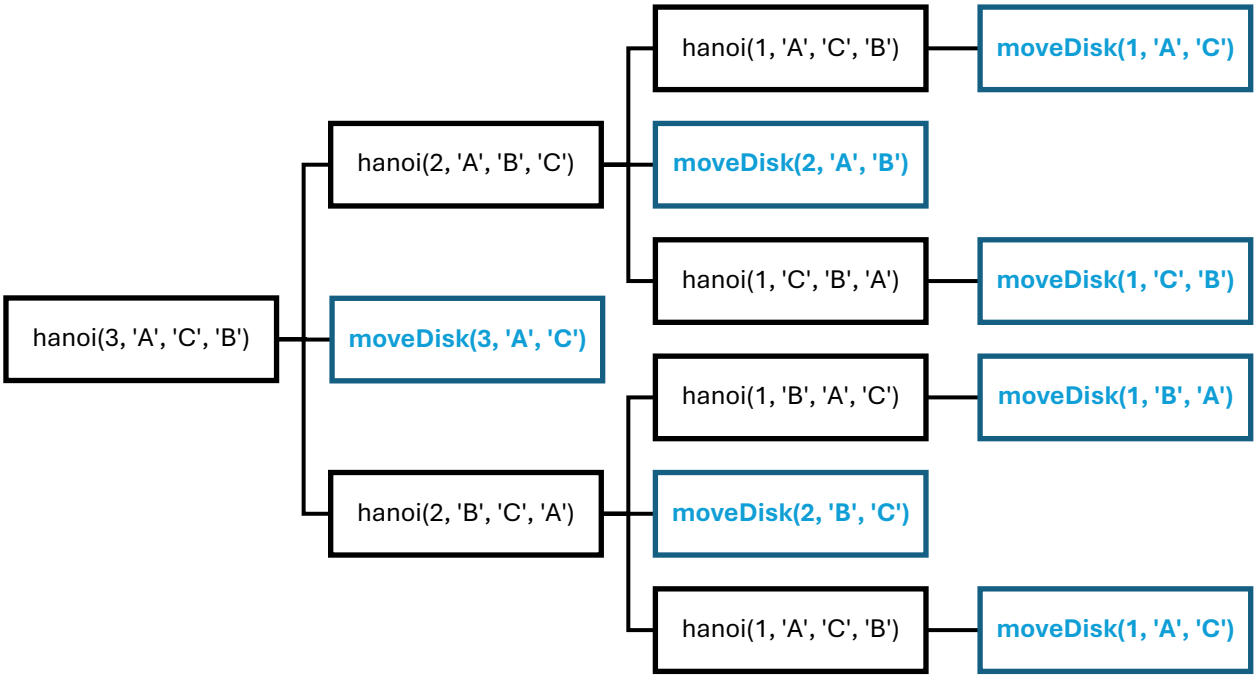
Function Calls for N disks (2^N - 1 calls):

```
hanoi(N, from, to, aux);
```

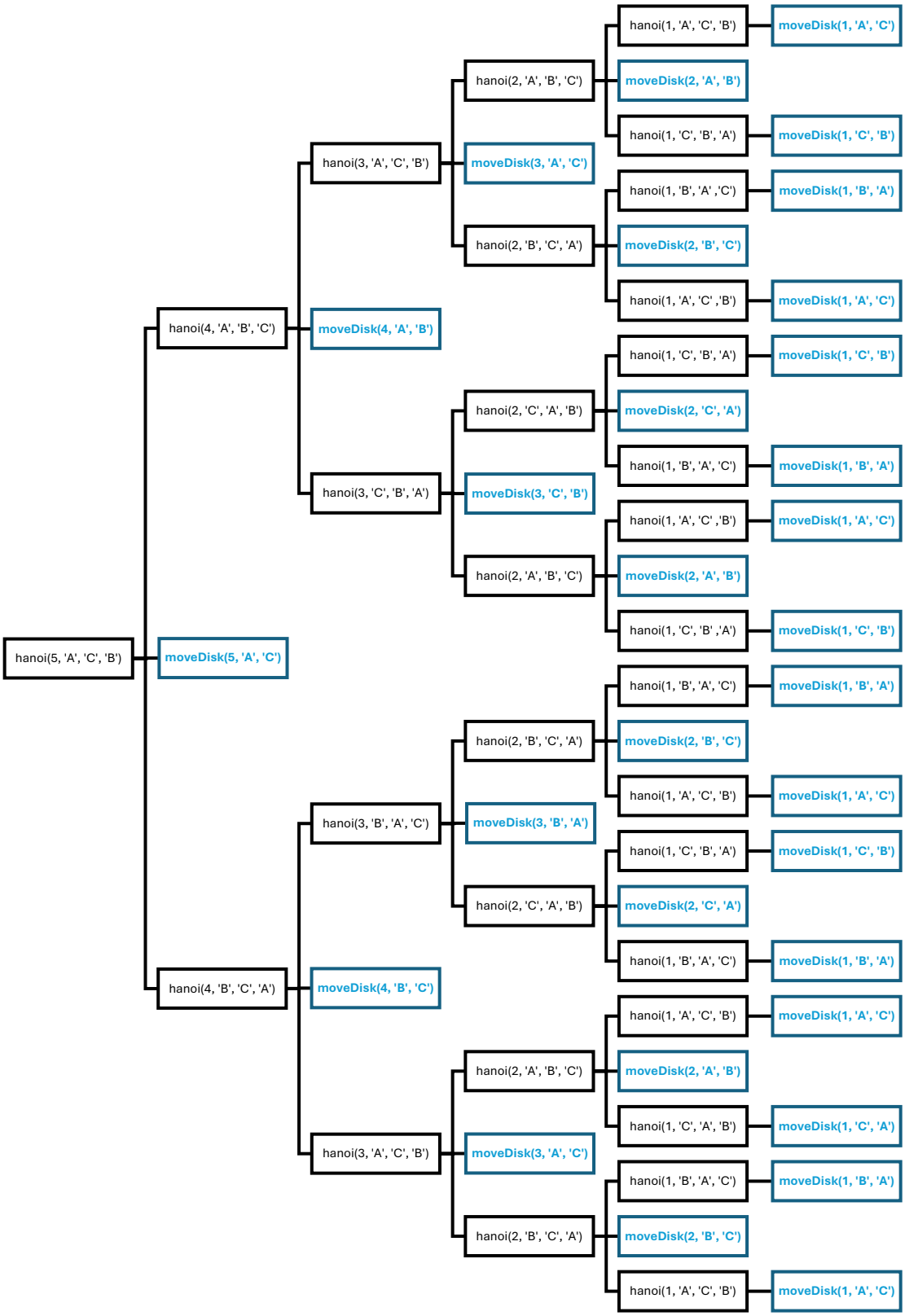
calls

```
hanoi(N - 1, from, aux, to);
moveDisk(N, from, to);
hanoi(N - 1, aux, to, from);
```

Function Calls for 3 disks (7 calls):



Function Calls for 5 disks (31 calls):



Source code (Annex-II):

```cpp
#include <iostream>

inline void moveDisk(int disk, char from, char to)
{
    std::cout << "Move disk <" << disk << "> from <" << from << "> to <" << to << ">\n";
}

void hanoi(int n, char from, char to, char aux);

int main()
{
    constexpr int NUM_DISKS = 5;
    hanoi(NUM_DISKS, 'A', 'C', 'B');
    return 0;
}

void hanoi(int n, char from, char to, char aux)
{
    // base case; move one disk
    if (n == 1)
    {
        moveDisk(1, from, to);
        return;
    }

    // move (n - 1) disks from (from) to (aux)
    hanoi(n - 1, from, aux, to);
    // now the remaining disk in (from) is biggest one
    // move biggest disk from (form) to (to)
    moveDisk(n, from, to);
    // move (n - 1) disks from (aux) to (to)
    hanoi(n - 1, aux, to, from);
}
```