Round 3 -Lab Manual

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Discipline to which the Lab belongs: Information Technology

Name of the Lab: Data Structure

Name of experiment: Tower of Hanoi

Kindly Refer these documents before filling the worksheet

1. **Coursework (MOOC) on Pedagogy , Storyboard , Lab Manual : h ttp://bit.ly/Vlabs-MOOC**
2. **Additional Documentation booklet for reference. http://vlabs.iitb.ac.in/vlabs-dev/document.php**
3. **Sample Git Repository. : https://github.com/BootTeam11/Boot2k19.git**

Round 2

1. Aim and Objective

To understand and code the problem of Tower of Hanoi using recursion for n disks.

2. Theory

The Tower of Hanoi is a mathematical game or puzzle. It consists of three rods, and a number of disks of different sizes which can slide onto any rod. The puzzle starts with the disks in a neat stack in ascending order of size on one rod, the smallest at the top, thus making a conical shape. The objective of the puzzle is to move the entire stack to another rod, obeying the following simple rules: • Only one disk can be moved at a time.

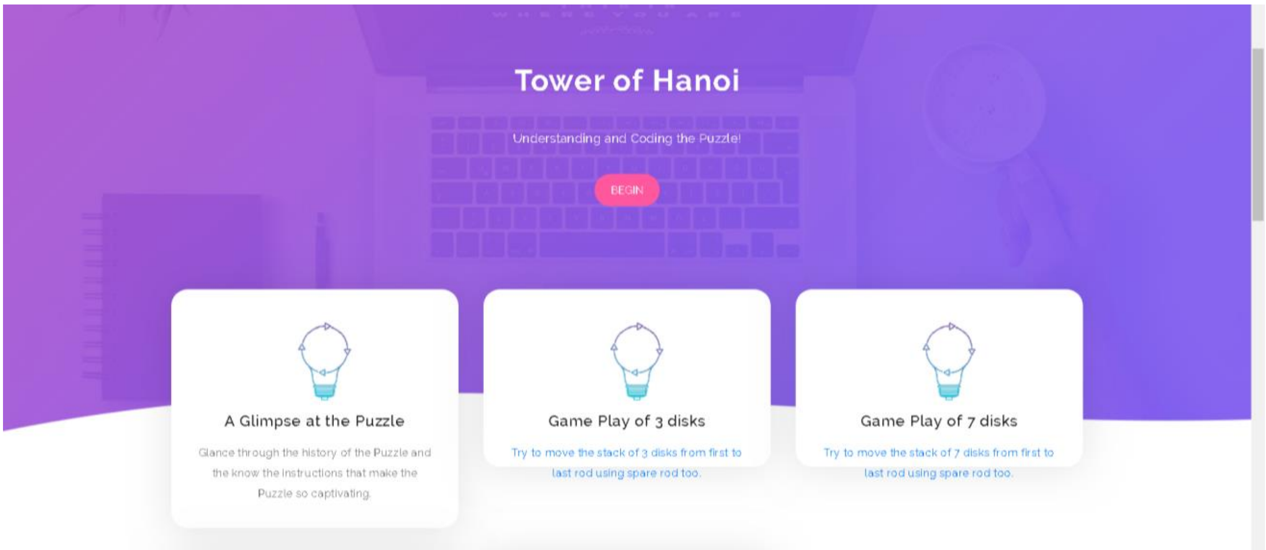
• Each move consists of taking the upper disk from one of the stacks and placing it on top of another stack i.e. a disk can only be moved if it is the uppermost disk on a stack.

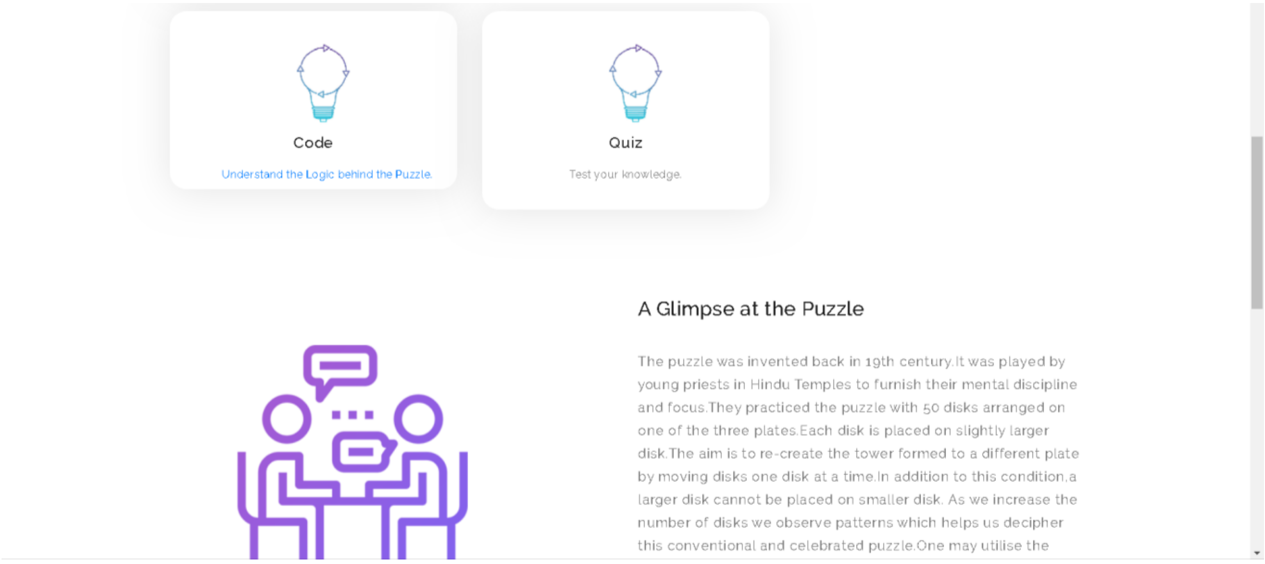
• No disk may be placed on top of a smaller disk. With three disks, the puzzle can be solved in seven moves.

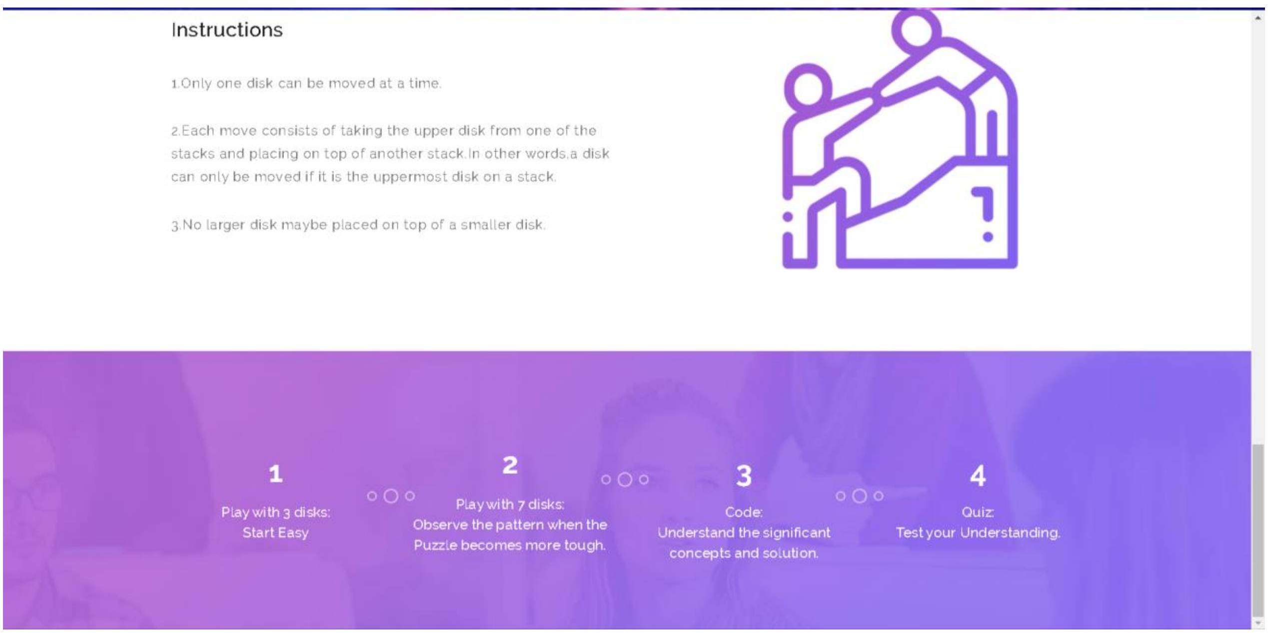
The minimum number of moves required to solve a Tower of Hanoi puzzle is 2 n - 1, where n is the number of disks.

3. Procedure (Protocol for navigating through the simulator with screenshots)

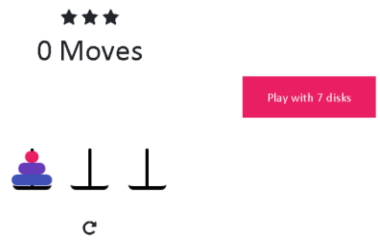
b3.1 Follow the steps as mentioned above and below the webpage.

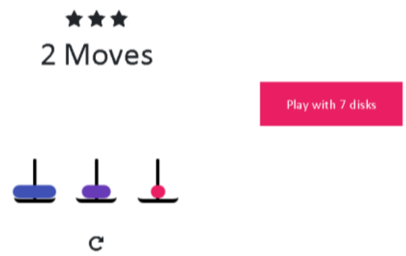


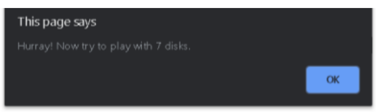


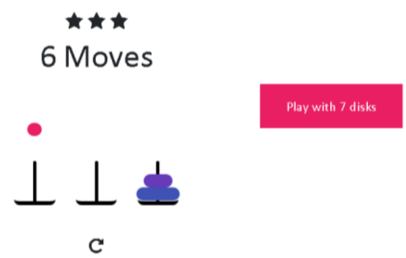


3.2 Play the Puzzle with 3 disks:

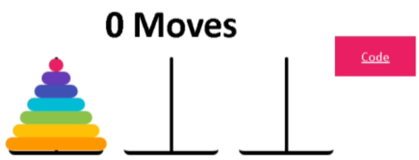




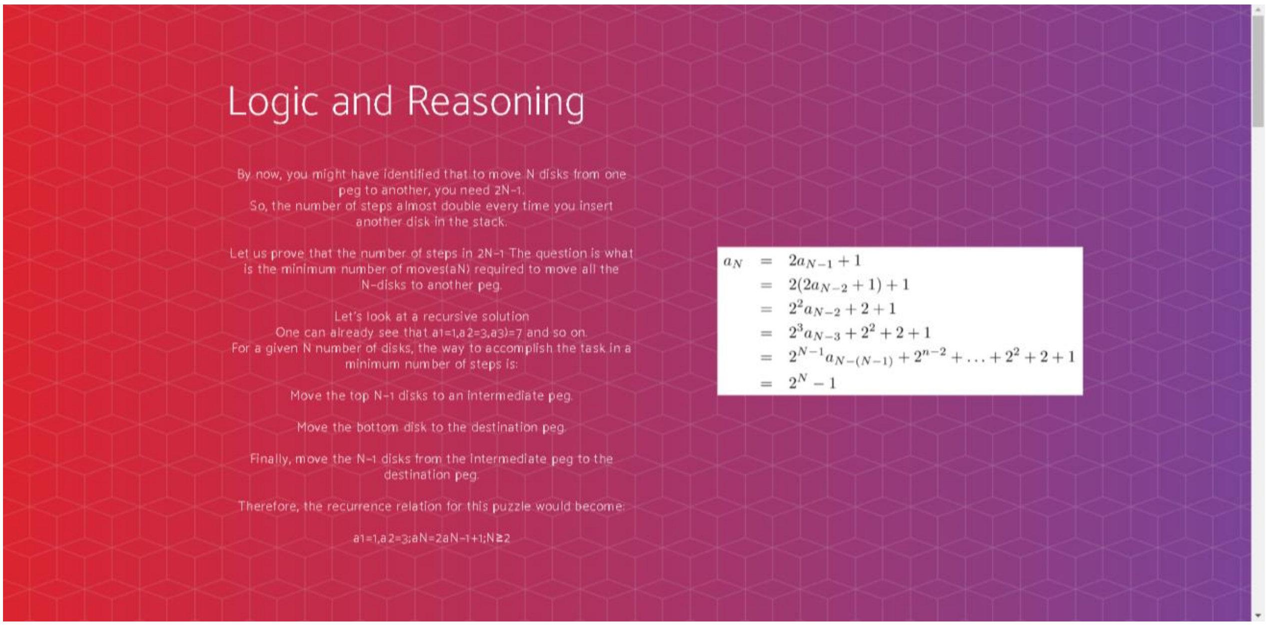


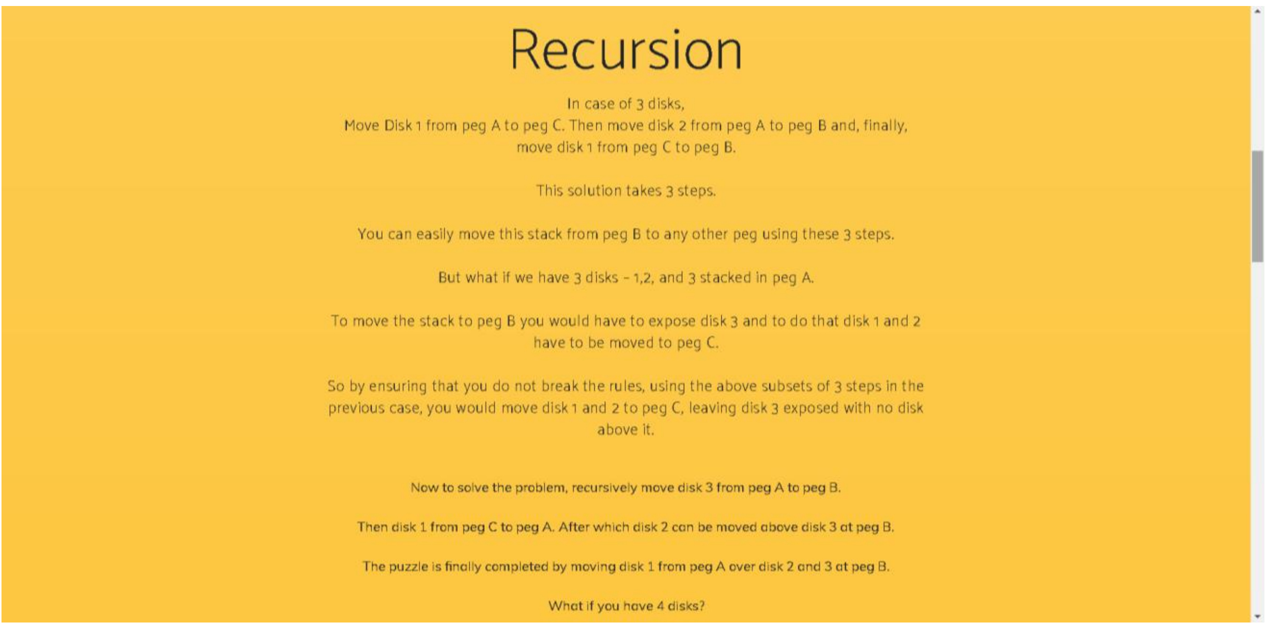


3.3 Similarly play the Puzzle with 7 Disks:



3.4 Proceed to Code:





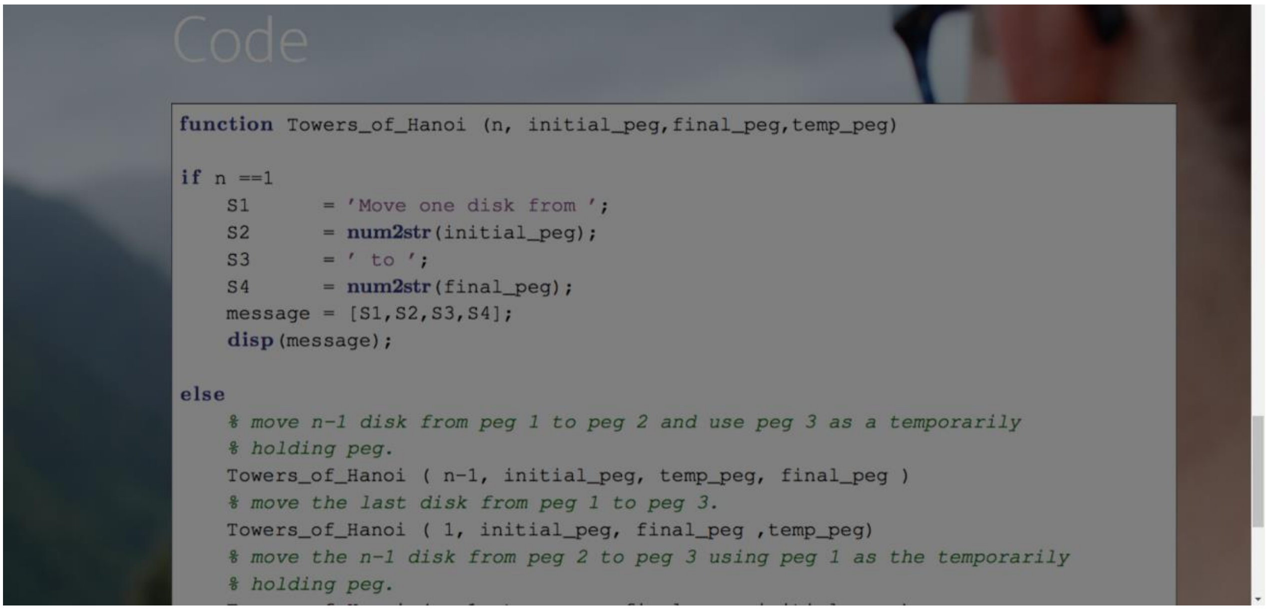
Algorithm

Create a function Tower with int 'a' – for number of disks, char 'from' – for from peg, char 'aux' – for a secondary peg, char 'to' – for destination peg

Put 'if' loop

If (a=1) i.e. if number of disk = 1, move it from 'initial peg' to the 'destination peg'

Else, call function tower for 'a-1' i.e. the number of disk -1, recall function tower for n-1 disk and move it 'from' to 'to' Recall function again using recursion until an or number of the disk is 1.



3.5 Proceed to Quiz Questions

<u>**4.Pre test Assessments**</u> *(Highlight the correct option with bold text)*

1. What is the name of the equation that is used to solve this puzzle?
   a. Geometric Progression
   b. Arithmetic Progression
   c. Fibonacci Sequence
   b. **Recurrence Relation (Correct answer)**

2.The Tower of Hanoi has many useful applications.It is used in which of the following fields :

a.Computer Programming and Algorithms
b.Psychological Research
c.Data Backup rotation scheme
d.All of these

5.Post test Assessments *(Write least one question for each learning objective from round 1)*

For Learning Objective 1

1. What is the number of moves required to solve Tower of Hanoi problem for k disks?
    a. 2k-1
    b.2k+1
    c.2^k+1
    bd.2^k-1

For Learning Objective 2

2. Tower of Hanoi problem can be solved iteratively
    a. True
    b. False

3.The optimal Data Structure used to solve Tower of Hanoi is:

a.Tree
b.Priority Queue
c.Heap
d.Stack