THE TWO FASCINATING PUZZLES – A CS 154 PROJECT

2048 **TOWER OF HANOI**

TEAM:

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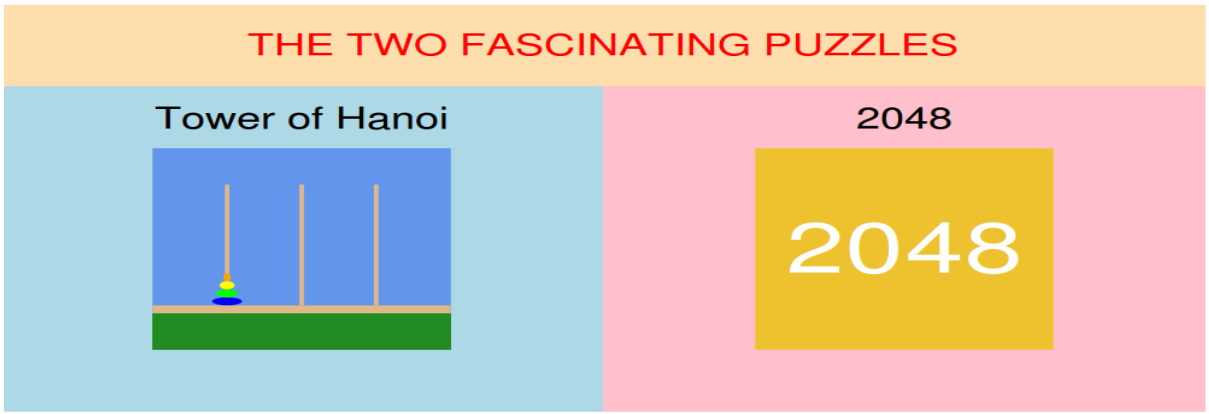
START SCREEN



1. PROBLEM DESCRIPTION :

1.1 2048

2048 is a single-player block sliding game on a 4x4 grid containg numbered tiles of exponents of 2.The game's objective is to slide numbered tiles on a grid to combine them to create a tile with number 2048.

The tiles are combined only if the numbers on them are same. The combination involves replacing the tiles with a new tile containing the sum of numbers on the previous tiles.

After every move there will be a new tile numbered either 2 or 4 on one of the empty slot in the grid.

The game is said to be over if there are no possible moves.

1.2 TOWER OF HANOI

The Tower of Hanoi (also called Lucas' Tower) is a mathematical game or puzzle.It consisits of three rods and a number of discs of different sizes which can slide on to any rod.The puzzle starts with the discs 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:

1. Only one disk can be moved at a time.
2. 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.
3. No disk may be placed on top of a smaller disk

2. SAMPLE INPUT/OUTPUT :

2.1 2048

INPUT : First the user is expected to choose the size of the grid, then operate with the Arrow keys (up,down,left,right) to perform the next move.

OUTPUT : Updated Grid according to the rules as mentioned above.

2.2 TOWER OF HANOI

INPUT : Choosing an Integer (indicating the number of dics) at the start of the game from the preferences button. Click the mouse on the tower from which you wanted to move the disk and then click again on the tower on which you wanted it to move.

OUTPUT : Updated World (containing discs of different sizes in three stacks) if the move is valid else returns the previous world.

3. LIMITATIONS AND BUGS :

3.1 Due to the limitatitons in in-built graph graph library (i.e., It is built with lists rather than mutable lists, so any operations involving appends takes a lot of time), So the process of checking the minimum possible path for the case of larger number of discs (9 and 10) in the tower of hanoi hint is taking a bit more time (about a minute).

3.2 Due to space constraint (i.e, screen size) in 2048 game we confined the maximum grid size to 9 x 9, however if called with a greater number it works but cannot be seen entirely on the screen.

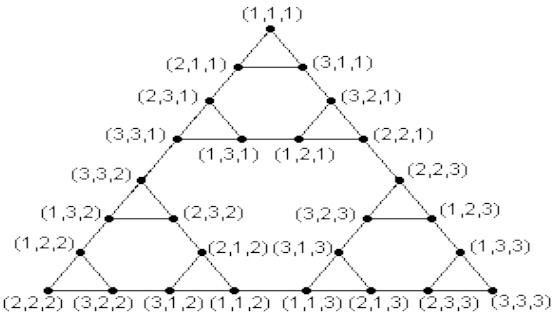
3.3 In Tower of Hanoi game we confined the maximum disc number to 10 because it is practically not possible for any one to do more than 1023 steps at a stretch.

4. POINTS OF INTEREST :

4.1 Actually there is no proper hint option for general Tower of Hanoi games in Play store.We added a hint option which gives the best possible move from a state. To implement this we actually converted the state diagram of a Tower of Hanoi into a graph using graph library.Later we used in built BFS to find the next move.

4.2 We memoized the function which generates a new tile in the 2048 game, so as to avoid senseless regeneration of a tile which was already generated in the previous moves. We also animated the motion of the tiles while sliding according to the user input.

4.3 We also included module tests for most of the functions which are being used while playiing the puzzles.



State Diagram for tower of hanoi with 3 discs

5. BASIC INTERFACE AND PROGRAM DESIGN :

5.1 2048

a) Requires 2htdp/image (basic teachpack for image processing) and Requires 2hdtp/universe (basic teachpack for creating interactive,graphical programs that consists of plain mathematical functions)

b) We will create a world using big-bang which generates random number (either 2 or 4) at a random possible location on the 4x4 grid and also functions which add numbers on the same numbered tiles while sliding based on the user input.

5.2 TOWER OF HANOI

a) Requires 2htdp/image (basic teachpack for image processing) and Requires 2hdtp/universe (basic teachpack for creating interactive,graphical programs that consists of plain mathematical functions)

b) We will create a world which shows the discs on three stacks and also structs and functions which update the world by moving the required disc to the required location (if possible) based on the user input.