Politecnico di Bari

AGENT-BASED ARTIFICIAL INTELLIGENCE
ARTIFICIAL INTELLIGENCE AND MACHINE LEARNING (AI TEST)
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Test duration: **2 hours**

We want to solve the **Hanoi Tower** puzzle. In this puzzle, you have three rods and n disks of different diameters. The puzzle begins with a set up like the one shown below (for three disks) where all of the disks are placed on one of the rods (rod A) with the largest at the bottom and the smallest at the top. The aim of the puzzle is to move all of these disks from rod A to rod C whilst obeying the following rules:

1. Only one disk can be moved at a time;

2. Only the disk at the top of a stack can be moved;

3. A disk cannot be placed on top of another disk with smaller diameter.

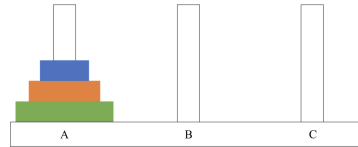[HINT] Obviously, you cannot move a disk from a rod if the rod is empty.

Figure 1: Initial state.

[HINT] For your convenience, here is a visual representation on solving this puzzle with three disks.
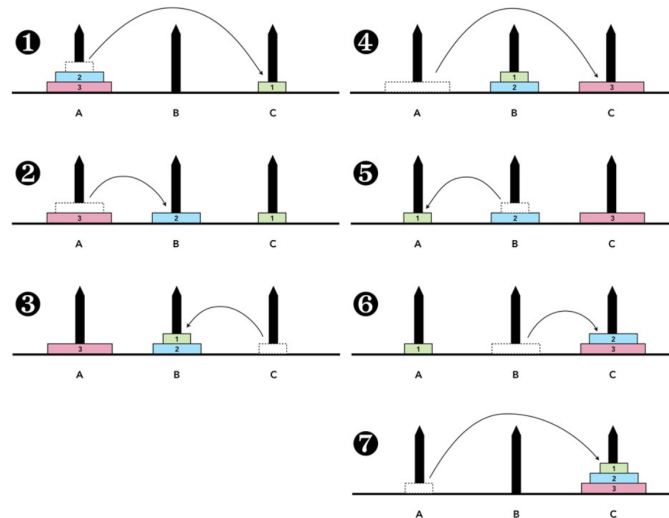

Figure 2: Representation of the actions required to solve a 3-disk Hanoi Tower.

Solve the Hanoi Tower puzzle with the **graph search** adopting the following strategies:

1. Depth-first;

2. A*.

[HINT] The optimal number of moves to solve the problem is $2^n - 1$.

Test your implementation for a Tower with three disks. The expected outcome is the sequence of actions to solve the puzzle.

[HINT] Suppose that who reads the sequence of actions knows this game. Then, she knows that only the disk at the top of a stack can be moved.