Artificial Intelligence: Assignment 4

Due date: March 8 (Wednesday)

This assignment does not include programming, and the maximal grade is 5; thus, it has twice less weight for the final grade than regular 10-point assignments.

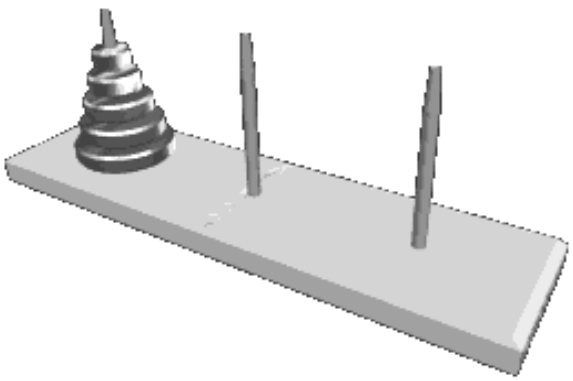
Problem 1 (3 points)
Read Chapters 11 and 12, and the PRODIGY paper, and answer the following questions:

(a) What is the difference between operators and inference rules?

(b) Can a partial-order planner handle inference rules? If it can, briefly explain how you can modify the POP algorithm to use inferences. If not, discuss the main obstacles.

(c) The textbook describes hierarchical decomposition in partial-order planning (see Sections 12.2 and 12.3). Suppose that you need to add a similar technique to PRODIGY, and integrate it with inference rules and control rules. Identify the main difficulties and briefly discuss ways to overcome them.

Problem 2 (2 points)
The *Tower-of-Hanoi puzzle* consists of three vertical pegs and several disks of different sizes (see the picture). Every disk has a hole in the middle, and several disks may be stacked on a peg. The rules allow moving disks from peg to peg, one disk at a time; however, the rules do *not* allow placing any disk above a smaller one. Initially, all disks are on the leftmost peg, and the task is to move them to the rightmost peg.

(a) Consider the puzzle with *three disks,* and represent it as a planning problem, using the simple STRIPS language. You should encode the initial state, goal, and operators for moving disks. The STRIPS operators must have conjunctive preconditions, and no conditional effects.

(b) The PRODIGY domain language is more powerful than STRIPS: it allows disjunctive and quantified preconditions, conditional effects, and inference rules. Can you use this power to construct a more compact encoding of the same puzzle?