

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?

