

15-889 Fall 2001 – Homework 2

Planning, Execution, and Learning

Due: Monday, October 29, 2001

Problem 1

One of the steps in partial-order planning is the identification of threats which need to be resolved and can be resolved in any order without the need to backtrack over different orders of solving different threats.

- Could this be a cause of planning *incompleteness* for partial-order planning? Justify/prove your answer.
- Could this be a cause of planning *inefficiency* for partial-order planning? Justify/prove your answer.

Problem 2

Let the length of a plan be the actual total number of steps in the plan.

- (a) Show an example where Graphplan *would necessarily* find a plan with N steps while Prodigy (or UCPOP) *could* find a plan of 2 steps. Explain under which conditions you agree with the terms “would necessarily” and “could.”
- (b) Show an example where Prodigy (or UCPOP) *could* find a plan with N steps while Graphplan *would necessarily* find a plan of 2 steps. Again, explain under which conditions you agree with the terms “could” and “would necessarily”. Furthermore, can you find an example where Prodigy using means-ends analysis *would necessarily* find a plan with N steps, while Graphplan *would necessarily* find a plan of 2 steps? Explain your example.
- (c) Would you be able to answer the questions above for 1 step instead of 2 steps? How or why not?

Problem 3

Consider the One-Way Rocket domain with its 3 operators: Load-Rocket, Unload-Rocket, and Move-Rocket. Recall that the rocket can only move *once* from one location to another location, as the Move-Rocket operator requires, as a precondition, that the rocket have fuel and it deletes that the rocket has fuel.

A friend of yours, Pat, claims that it is trivial to extend this domain to a multi-way domain with a Refuel operator. Pat further states the extended domain and says: At each location, there are two different types of places, namely a building and a gas-station. Rockets can move between any two locations, including from and to buildings or gas-stations. Rockets can move if they have gas. Rockets only load and unload packages at a building, and they can only refuel at a gas-station. Do you agree with Pat that representing this extension of the domain is trivial? Either show the new domain or argue why it is not trivial.