Tutorial Week 3: Classical Planning

Guidelines

You may discuss the content of the questions with your classmates. But everyone should work on and be ready to present ALL the solutions.

Problem 1 Planning Models

You have been appointed as the lead engineer in the development team of SG Smart Taxi, an autonomous taxi service. Define the characteristics of the task environment in which the taxi has to be deployed. Support your answer with sufficient reasoning behind your choices.

a) Comment on the observability aspect of the environment.

b) Is the environment a single-agents, collaborative multi-agent or competitive multi-agent environment? Justify your answer.

c) Will the environment be deterministic or stochastic? Give an example.

d) Would you model the environment to be episodic or sequential? Explain your choice.

Problem 2 STRIPS Planning Models

[RN3e 10.4] The monkey-and-bananas problem is faced by a monkey in a laboratory with some bananas hanging out of reach from the ceiling. A box is available that will enable the monkey to reach the bananas if he climbs on it. Initially, the monkey is at *A*, the bananas at *B*, and the box at *C*. The monkey and box have height *Low*, but if the monkey climbs onto the box he will have height *High*, the same as the bananas. The actions available to the monkey include *Go* from one place to another, *Push* an object from one place to another, *ClimbUp* onto or *ClimbDown* from an object, and *Grasp* or *Ungrasp* an object. The result of a *Grasp* is that the monkey holds the object if the monkey and object are in the same place at the same height.

a) Write down the initial state description.

b) Write the six action schemas.

c) Suppose the monkey wants to fool the scientists, who are off to coffee, by grabbing the bananas, but leaving the box in its original place. Can this general goal (i.e., not assuming that the box is necessarily at *C*) be solved by a STRIPS-style system?

Problem 3 Sussman Anomaly
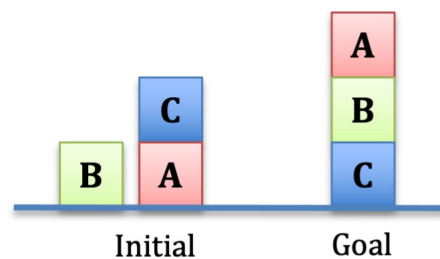
[RN3e 10.7] The figure shows a blocks-world problem known as the Sussman anomaly. The problem was considered anomalous because the noninterleaved planners of the early 1970s could not solve it.

a) Write a definition of the problem.

b) Solve the problem, either by hand or with a planning program.

c) A noninterleaved planner is a planner that, when given two subgoals *G1* and *G2*, produces either a plan for *G1* concatenated with a plan for *G2*, or vice-versa. Explain why a noninterleaved planner cannot solve this problem.