

CS 4649/7649: RIP - Robot Intelligence - Planning

PROJECT 1: CLASSICAL SOKOBAN PLANNER

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1 Pre-Project: Towers of Hanoi

Planners Used

The two classical planners which we are using for the Towers of Hanoi problem are the Blackbox planner [1] (downloaded from <http://www.cs.rochester.edu/~kautz/satplan/blackbox/blackbox-download.html>) and the FF planner [2] (downloaded from <http://fai.cs.uni-saarland.de/hoffmann/ff/FF-v2.3.tgz>). The definition of the Towers of Hanoi domain, as well as the representation of the initial state of the problem (from Figure 1) are in the corresponding PDDL files, namely *hanoi-domain.pddl* and *hanoi-3.pddl*.



Figure 1: Towers of Hanoi with 3 disks

1.1 Questions

1. Explain the method by which each of the two planners finds a solution
2. Which planner was fastest?
3. Explain why the winning planner might be more effective on this problem

2 Project Part I: Sokoban PDDL

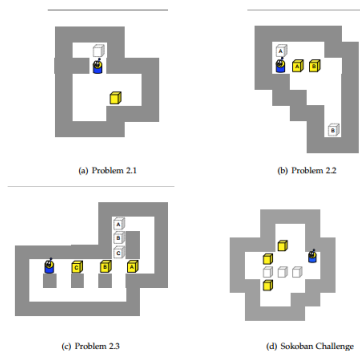


Figure 2: Sokoban Problems

2.1 Questions

1. Show successful plans from at least one planner on the three Sokoban problems in Figure 2 (1-3). The challenge problem is optional
2. Compare the performance of two planners on this domain. Which one works better? Does this make sense, why?
3. Clearly PDDL was not intended for this sort of application. Discuss the challenges in expressing geometric constraints in semantic planning
4. In many cases, geometric and dynamic planning are insufficient to describe a domain. Give an example of a problem that is best suited for semantic (classical) planning. Explain why a semantic representation would be desirable

3 Project Part II: Sokoban Planner

3.1 Questions

1. Give successful plans from your planner on the Sokoban problems in Figure 2 and any others
2. Compare the performance of your planner to the PDDL planners you used in the previous problem. Which was faster? Why?
3. Prove that your planner was complete. Your instructor has a math background: a proof “is a convincing argument.” Make sure you address each aspect of completeness and why your planner satisfies it. Pictures are always welcome.
4. What methods did you use to speed up the planning? Give a short description of each method and explain why it did or didn’t help on each relevant problem

4 Post-Project: Towers of Hanoi Revisited

4.1 Questions

1. Give successful plans from at least one planner with 6 and 10 disks
2. Do you notice anything about the structure of the plans? Can you use this to increase the efficiency of planning for Towers of Hanoi? Explain

In a paragraph or two, explain a general planning strategy that would take advantage of problem structure. Make sure your strategy applies to problems other than Towers of Hanoi. Would such a planner still be complete?

References

- [1] Henry Kautz and Bart Selman. Blackbox: A new approach to the application of theorem proving to problem solving. In *AIPS98 Workshop on Planning as Combinatorial Search*, volume 58260, pages 58–60, 1998.
- [2] J. Hoffmann. The fast-forward planning system. *AI magazine*, 22(3), 2001.