

Principles of AI Planning

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Exercise Sheet 8

Due: Friday, December 19th, 2014

Exercise 8.1 (Accuracy of pattern database heuristics, 5 points)

Show that PDB heuristics can become arbitrarily inaccurate even if almost all variables are represented in the pattern.

More formally: Show that there exists a family of FDR planning tasks $(\Pi_n)_{n \in \mathbb{N}}$ (that are not trivially unsolvable and that contain no trivially inapplicable operators) with $\Pi_n = (V_n, I_n, O_n, \gamma_n)$ where $|V_n| = \Theta(n)$, $h^*(I_n) = \Omega(n)$, and such that for all patterns $P_n \subsetneq V_n$ with $|P_n| = |V_n| - 1$, we have $h^{P_n}(I_n) = O(1)$.

Hint: Generalize the logistics example from slides 8-10 in `aip11.pdf`.

Exercise 8.2 (Syntactic projections vs. projections, 3 + 2 points)

Let Π be a planning task in finite-domain representation and let P be a pattern for Π . Show that:

- (a) If Π is a SAS⁺ planning task that is not trivially unsolvable and that has no trivially inapplicable operators, then $\mathcal{T}(\Pi|_P) \stackrel{\mathcal{G}}{\sim} \mathcal{T}(\Pi)^{\pi_P}$.
- (b) If there are conditional effects in Π , then it is not true in general that $\mathcal{T}(\Pi|_P) \stackrel{\mathcal{G}}{\sim} \mathcal{T}(\Pi)^{\pi_P}$.

You can and should solve the exercise sheets in groups of two. Please state both names on your solution.