

Principles of AI Planning

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Exercise Sheet 8

Due: Friday, December 15th, 2017

Exercise 8.1 (Orthogonality and pairwise orthogonality, 3+3 points)

Recall: We call abstractions mappings $\alpha_1, \dots, \alpha_n$ over the same transition system \mathcal{T} *orthogonal* if for all transitions $\langle s, \ell, t \rangle$ of \mathcal{T} , we have $\alpha_i(s) \neq \alpha_i(t)$ for at most one $i \in \{1, \dots, n\}$. Moreover, we say that $\alpha_1, \dots, \alpha_n$ are *pairwise orthogonal* if for all $j, k \in \{1, \dots, n\}$ with $j \neq k$, mappings α_j and α_k are orthogonal.

Prove the following: $\alpha_1, \dots, \alpha_n$ are orthogonal if and only if they are pairwise orthogonal.

Exercise 8.2 (Affecting labels vs. orthogonality, 4 points)

Recall: For a transition system \mathcal{A} and a label ℓ of \mathcal{A} , we say that ℓ *affects* \mathcal{A} if \mathcal{A} has a transition $\langle s, \ell, t \rangle$ with $s \neq t$.

Prove the following: Let \mathcal{A}_i be an abstraction of some transition system \mathcal{T} with abstraction mapping α_i for $i \in \{1, 2\}$. If no label of \mathcal{T} affects both \mathcal{A}_1 and \mathcal{A}_2 , then α_1 and α_2 are orthogonal.

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