

Principles of AI Planning

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SS 2005

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Exercise Sheet 12

To be submitted Monday, July 11

Exercise 12.1 (Partial Observability I – 4 credits)

Consider the robot navigation problem with the following states split to four observational classes as follows, corresponding to states next to north or south wall, west or east wall, both, or no wall.

04	14	24	34	44
03	13	23	33	43
02	12	22	32	42
01	11	21	31	41
00	10	20	30	40

The actions are the following.

gowest(x, y) = $x - 1, y$, applicable when $x \in \{1, 2, 3, 4\}$

goeast(x, y) = $x + 1, y$, applicable when $x \in \{0, 1, 2, 3\}$

gosouth(x, y) = $x, y - 1$, applicable when $y \in \{1, 2, 3, 4\}$

gonorth(x, y) = $x, y + 1$, applicable when $y \in \{0, 1, 2, 3\}$

Derive a belief state that includes $I = \{22, 23, 32, 33\}$ starting from the goal belief state $G = \{22\}$ by using strong preimages and \oplus as discussed in the lecture.

You may first trace the execution of a plan in the forward direction starting from I , and once you know how it works, do the derivation backwards.

Exercise 12.2 (Partial Observability II – 6 credits)

Derive a formula for the number of belief states when there are n state variables and m of them are observable. Check that your formula works correctly in the special cases of full observability ($m = n$) and unobservability ($m = 0$).

You may work on these assignments and submit your results **in groups of two students**. Make sure to clearly indicate both names on your work. **You may write your answers in English or German**. Please return your homework on monday **before** 14:15.

Exercise marks count towards your final grade for this course, which is calculated from exercise marks (**15%**) and exam marks (**85%**).