Principles of AI Planning

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SS 2005

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Exercise Sheet 10

To be submitted Monday, June 27

Exercise 10.1 (Probabilistic Planning – 5 credits)

An agent has a large supply of eggs and its goal is to get the contents of two(!) good eggs and no bad ones into one of two bowls. Each egg is good with probability 50 percent. The agent can pick up an egg and empty its contents into one of the bowls (= one action execution). The agent can also empty a bowl by either dumping its content into a garbage can (= one action execution) or dumping its content into the other bowl (= one action execution). At any time, the agent can find out whether a bowl contains the contents of only good eggs by smelling it (= one action execution).

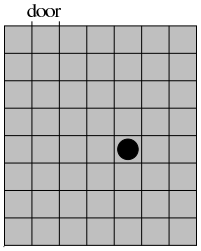
(a) Devise a CONFORMANT plan that maximizes the probability of solving the task with 5(!) or fewer action executions (that is, parallel actions are not allowed). A conformant plan is just an (unconditional) sequence of actions.

(b) Devise a CONDITIONAL plan that maximizes the probability of solving the task with 5(!) or fewer action executions (that is, parallel actions are not allowed). A conditional plan is one that can contain sensing actions and where the execution of actions can be conditioned on the information provided by sensors. To solve this problem, we suggest that you do not consider the execution of actions that clearly cannot be optimal, such as emptying the contents of an egg into a bowl that contains already the contents of two(!) eggs.

In both cases, do not just give an optimal plan but also the reasoning that shows that your plan is indeed optimal.

Exercise 10.2 (Partial Observability – 5 credits)

Consider a variant of the unobservable robot navigation problem (lecture 18) with the difference that the robot does not know whether its nose initially points to north, south, east or west.



Show that the problem is still solvable (there is a sequence of operators after executing which the robot will be outside the classroom). We assume that the door is one-directional and the robot cannot get back to the classroom once it has left it.

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%**).