Principles of AI Planning

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Exercise Sheet 1

Due: Friday, November 1st, 2019

Send your solution to `mario.kantz@gmail.com` (PDF only) or submit a hardcopy before the lecture. The exercise sheets may and should be worked on and handed in in groups of two or three students. Please indicate all names on your solution.

Exercise 1.1 (Teamwork, 5 **additional** points)

We believe that working in groups is a strictly dominant strategy for you. If you submit your solution as a group of two or three, you will automatically receive the additional points. Otherwise, you can collect these points by sending an email to `mario.kantz@gmail.com` with your name so that we can form groups of students. Please use as subject of the email: *[aip1920] Teamwork*.

Exercise 1.2 (State space size, 5 points)

Assume you want to clean the floor of a huge room, and there are five robotic vacuum cleaners at your availability that can work in parallel. We assume for simplicity that the floor is discretized into 10×10 discrete cells and that at each time point each robot is in exactly one cell. We also assume that several robots can be in the same cell at the same time. Furthermore, each cell is either clean or dirty and each robot has a battery with 20 charge levels. The five robots are distinguishable, so it is important *which* robot is at a particular location.
The goal, of course, is to clean the entire room by exectuing cleaning or movment actions between adjacent cells. Each action costs one charging unit.
Determine the size of the state space of this planning task, i.e., the number of possible different states. How much time would it take to generate the whole state space if generating one state took $1\mu s$ ($= 10^{-6}s = 0.000001s$)?

Exercise 1.3 (Planning literature, 5 points)

Jörg Hoffmann, a well-known researcher in AI planning, wrote an invited paper for the annual German Conference on Artificial Intelligence (KI) in 2011, titled "Everything You Always Wanted to Know About Planning (But Were Afraid to Ask)".
It is an entertaining account of current research in AI planning, primarily addressed at students who have already attended an AI planning class (or at least the part of an AI course devoted to planning) and are about to start doing research in AI planning. Still, it is worthwhile for you reading it now (and maybe again in a few months when the AI planning course is over). You do not have to understand everything. Much of the material from the paper will be studied rigorously in this course later.
The paper can be found here: `http://fai.cs.uni-saarland.de/hoffmann/papers/ki11.pdf`
Your task: Read the paper (however cursorily) and write, as an answer to this exercise, two questions that come to your mind when reading it and that you would like to discuss during the course of the lecture.