Principles of AI Planning

Prof. Dr. B. Nebel, Dr. R. Mattmüller
D. Speck
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University of Freiburg
Department of Computer Science

Exercise Sheet 1

Due: Friday, October 30th, 2015

Exercise 1.1 (State space size, 5 points)

Suppose that you want to clean the floor of a huge room, and that there are five robotic vacuum cleaners at your availability that can work in parallel. We assume for simplicity that the floor area is discretized into 100 cells, that at each time point each robot is located in exactly one cell, and that several robots can be in the same cell at the same time. Furthermore, the floor in each cell is either clean or dirty. Each robot has a battery with 20 charge levels (level 1: empty battery; level 20: fully charged), and each cleaning or movement action costs one unit/level of charge. Some recharching stations are present in the room at specified cells. We assume that the dirt bins of the robots are large enough to hold all the collected dirt.
The five robots are distinguishable, so it is important *which* robot(s) is/are at a particular location. The goal is, of course, to clean the entire room.
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 1.2 (Planning literature, 5 points)

Prof. Jörg Hoffmann 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 starting researchers in this field. 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 necessarily 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 in the exercise group.

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