Principles of AI Planning

Prof. Dr. B. Nebel, Dr. R. Mattmüller
D. Speck
Winter Semester 2016/2017

University of Freiburg
Department of Computer Science

Exercise Sheet 1
Due: Friday, October 28th, 2016

Exercise 1.1 (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. Each robot has a battery with 20 charge levels, and each cleaning or movement action between two adjacent cells costs one unit of charge. A couple of recharging stations are present in the room. We assume for simplicity 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 is 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)

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 in the exercise group.

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