

Principles of AI Planning

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Exercise Sheet 1

Due: Friday, October 31st, 2014

Exercise 1.1 (State space size, 5 points)

The “Westeros Delivery Service” serves 5 towns: King’s Landing, Winterfell, Lannisport, Meereen and Volantis. In each of these towns, errand boys travel between all districts (within their respective town). King’s Landing consists of 8 such districts, Winterfell of 2, Lannisport of 6, and Meereen and Volantis each have 12.

Furthermore, in each town one of the districts contains a landing place for dragons, the exception being King’s Landing, which has 3 such districts.

Currently, the delivery service is entrusted with delivering 30 packages to other districts or towns. At its disposal are 3 dragons as well as (number of districts)/2 errand boys per town.

Errand boys can pick up packages if they are located in the same district. Dragons can pick up packages if both the dragon and the package are at the same dragon landing place (Dragons cannot land in any other districts¹). Unloading packages is subject to the same restrictions.

Surprisingly, in all of the Seven Kingdoms’ recorded history there has never been a documented case of any errand boy or dragon ever being overencumbered (thus being unable to pick up any more packets). Their strength seems to know no bounds . . .

As ancient beings of great power, each dragon carries a unique name, and bureaucracy forces every errand boy to choose a distinct name for himself as well. For this reason, it is indeed very important *which* dragon(s) and/or *which* errand boy(s) are at a particular location.

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 traverse the whole state space if visiting 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 can and should solve the exercise sheets in groups of two. Please state both names on your solution.

¹Unless for demolition work, but Westeros leaves that field to others.