Lab 1 - Vacuum Cleaning Agent - Artificial Intelligence

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1 Introduction

The task is to implement the control program for a vacuum cleaner robot. The robot is situated in a simple rectangular grid of cells without any obstacles. Some cells may contain dirt. The robot should clean up all the dirt in the grid.

2 Tasks

2.1 Characterising the environment

Is the environment **partially observable** or is it **fully observable**?

*The environment is **partially observable** because the robot's sensors don't s give it access to the complete state of the environment, only the cell in which the robot stands.*

Is the environment **single agent** or is it **multiagent**?

*There is only a single robot solving the problem in the environment so the environment must be **single agent**.*

Is the environment **deterministic** or is it **stochastic**?

*The environment might seem stochastic because we can not know where dirt might appear however the environment is **deterministic** since the next state of the environment is always known given the current state and the agents actions.*

Is the environment **episodic** or is it **sequential**?

*The environment might seem episodic because the agent only cares about it's current action and what it should do next. However the environment is **sequential** because each action is determined by the cell the robot is on and that cell is determined by the previous action of the robot.*

Is the environment **static** or is it **dynamic**?

*It's **static** because the grid doesn't change.*

Is the environment **discrete** or is it **continuous**?

*The time (how the environment experiences time) is **discrete**, meaning that the time doesn't "flow" continuously.*

2.2 Developing a strategy

The first part of the strategy is to find the bottom right corner of the rectangle. We do that by turning right (assuming the robot always "spawns" facing north) until we hit a wall an then we turn right again until we hit a wall again. We then must be at the bottom right corner.

The next part of the strategy is to face north and go forward until we hit a wall. Then go west by one cell and go south till we hit a wall again, then go west again. Doing this (going back and forth) repeatedly until we hit either the top or bottom left corner and of course cleaning any dirt we encounter.

2.3 Implement the strategy

In the Java project following the report is the actual implementation of the missing parts of the vacuum cleaner Java program (in the file "VacuumCleaningAgent.java").

2.4 Testing the strategy

Testing with the "vacuumcleaner.gdl" environment (which is always the same) always gives the same result; 20 Points, with all the dirt removed and in 84 steps. However we have to test the agent further with a random environment to confirm that the agent behaves correctly.

2.5 Testing with the random environment

"vacuumcleaner_random.gdl" also always ends with all the dirt gone, however the agent doesn't always end up at the starting place.

2.6 Is the agent rational?

The agent is rational. It chooses the actions that maximizes it's success measure i.e. sucking up all the dirt and ending up at home, based on it's percept sequence and prior knowledge of the environment. It is worth noting though that the agent is not learning.