Lab Assignment 1
Vacuum Cleaning Agent

T-622-ARTI,Artificial Intelligence, 2023-1

Reykjavik University - School of Computer Science, Menntavegi 1, IS-101 Reykjavík, Iceland

Jonas Hagg `jonash22@ru.is`
Philipp Zimmermann `philipp22@ru.is`
Jonathan Lutz `jonathan22@ru.is`

January 13, 2023

Abstract

This is the report for the first lab assignment of the artificial intelligence course.

1 Tasks

1.1 Task 1

Static vs. dynamic The environment is static because the robot could scan the environment at the beginning once. Based on that static information it could clean up the whole space. The environment does not change by itself.

Deterministic vs. stochastic The environment is deterministic because the next state of the environment is completely determined by the current state and the action executed by the agent.

Fully observable vs. partially observable The environment is only partially observable for the vacuum cleaner, because it only can observe a single cell of the room at any given time.

Episodic vs. Sequential It is sequential because our agent needs to remember where it started to be able to drive home. Thus, it needs to maintain some internal state and its actions do not only depend on the given perceptions.

Discrete vs. Continuous It is discrete because we only have a limited set of perceptions and actions.

Single vs. Multi-agent We have a Single-Agent environment, because the vacuum cleaner is the only agent.

1.2 Task 2

In the beginning, the Agent saves its "Home"-location as position (0, 0). Then it tries to find a corner in the Room. By going South until it hits a wall and then continuing to go West until it hits the next wall he will always end up in the South-West Corner during this starting process.

Once the vacuum reached the initial corner, we explore the whole squared environment following a "snake like" approach. If it reaches a corner again, the vacuum visited each cell.

When the Agent finished cleaning up the entire room it has to go back to his "Home"-location. To do so it first checks the X coordinate of its current Position and starts going in the need Orientation until it reaches a Position where X equals 0. Then it proceeds a similar process to find a Position where Y equals 0 to end up at his "Home"-location at (0, 0).

1.3 Task 3

The implementation is uploaded with the ZIP file.

1.4 Task 4

Game File	Steps required	Average steps required
vacuumcleaner.gdl	60	60
vacuumcleaner_random.gdl	60-64	63
vacuumcleaner_random_big.gdl	157-176	164.1

1.5 Task 5

We improved our agent by the following means:

- Instead of bumping into the wall to detect the edge of the field, we measure the size of the field during initialization. This allows us to reduce the number of steps in the 10x10 field by 9 and in the 5x5 field by 4 steps.
- The robot needs to adjust its orientation before it returns to its home field. We improved this rotation. Instead of turning to the right until we reached the correct orientation, we compute if it is faster to turn left. This reduces the number of steps by at most by 2 steps.

1.6 Task 6

Yes, it is rational because the implementation aims to reduce the number of steps needed to reach all fields. Thus, the selected action of the agent is expected to reduce the number of required steps until the whole environment is explored.