Reykjavík University

Artificial Intelligence

SC-T-622-ARTI

Vacuum Cleaning Agent

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1 Tasks

1.1 Nature of the environment

1. The environment is partially observable. The agent is placed at a point in a grid and upon booting it does not know where in the grid it is located, which direction its facing or how large the grid is. Thus the environment is partially observable as the agent needs to discover this by himself.

2. The environment is deterministic. Upon locating a corner the agent knows every step that follows in order to spiral to the center. An argument can be made for stochastic though when the agent is still locating a corner and counting grid size.

3. The environment is sequential.

4. The environment is static.

5. The environment is discrete.

6. The environment is single-agent.

1.2 Strategy

The goal of the vacuum is to suck up dirt that can appear anywhere within a grid. Our strategy to achieve this is to cover every single point in the grid by spiraling from the edges to the center before returning home. First the bot locates a corner by moving forward and counting its bumps, upon bumping a wall twice we know for certain that it is located at a corner. Then by moving to the opposite wall from the corner it can learn the width and height of the grid. Once we know the grids size the bot can start spiraling to the center, sucking all dirt on the way. Based on the direction it faces once completing the spiral compared to the direction it started with facing, the bot can route home by moving in whatever direction brings X and Y towards 0.

1.3 Implementation

N/A - No question.

1.4 Testing

Our agent completed vacuumcleaner.gdl in 70 steps, vacuumcleaner_random.gdl in 53 steps and vacuumcleaner_random_big.gdl in 160.

1.5 Optimize

N/A

1.6 Rational

N/A