HÁSKÓLINN Í REYKJAVÍK
REYKJAVIK UNIVERSITY

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T-662-ARTI

Lab 1: Vacuum Cleaning Agent - Artificial Intelligence

Group 11

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1. **(12 points) Characterise the environment (is it static or dynamic, deterministic or stochastic, . . .) according to all 6 properties mentioned on slide 13 (Agents) or section 2.3.2 in the book.**
    a. We believe the environment to have the following 6 properties
        1. Deterministic not Stochastic
            - The next state of the environment depends on the current state and the action the agent takes, not on anything else which makes it deterministic.
        2. Partially observable not fully observable
            - The agent does not possess the full state of the game, it only does things according to its sensors which only cover the current cell or when we bump walls.
        3. Single Agent not multiagent
            - There is only one agent which makes this a single agent environment.
        4. Sequential not episodic
            - The environment is sequential since the state of the game, i.e. the position of the agent, depends on the previous actions of the agent.
        5. Static not dynamic
            - Nothing in the environment changes while the agent is deliberating.
        6. Unknown not known
            - We do not know where the dirt is or how much dirt is left, we do not know our position (accept what the agent keeps a track of) so we do not know the full state of the game.

2. **(10 points) Develop a strategy for the agent such that it fulfills the goal and describe this strategy in a few sentences.**
    a. Our strategy was pretty simple. We don't know how much dirt there is so we must visit every single cell in the grid and suck dirt as soon as it is perceived. So what we decided to do was make the robot go straight until it bumps a border, then turn right and repeat until all borders are found. After every border is found we want to make the robot visit all cells by going a spiral, and then return to the starting position.

3. **(60 points) Implement the missing parts of the vacuum cleaner Java program (see below) such that it encodes your agent function (strategy).**
    a. See code in hand in zip file

4. **(10 points) Test your program with all three provided environments. Test with environments with random in their name can give slightly different results each time, so they should be repeated several times. Record the number of steps it takes to finish each environment.**
    a. The following are the averages from three tests with our agent.

Environment	**Average Steps**
Vacuumcleaner	59
Vacuumcleaner_Random	53
Vacuumcleaner_Random_Big	150

5. **(8 points) Is your agent rational? Justify your answer.**
    a. We believe our agent to be rational because when it perceives dirt or bumps it takes a rational action. For example when our agent perceives dirt it sucks. When it perceives a bump it turns right and never bumps into the same side of the border again. Note that this does not guarantee to give the most optimal action, it only prevents the agent from doing something bad like sucking when there is no dirt, not sucking dirt or bumping again.