



CECOS University

BS (Software Engineering)

Intelligent Agents and Environment Classification

Assignment 1

Artificial Intelligence

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AI Agents and Environment Analysis

Memoryless vs Memory Agents in Vacuum-Cleaner Environments

a.

In the 2x10 grid world with initial dirt probability of 0.2, the performance measure includes penalties for movement (-1), rewards for cleaning dirt (+100), and a significant penalty for not returning home (-1000). The agent starts at [2,1] and knows the world size, its position, and orientation. With bump, home, and dirt sensors, a memoryless agent might not remember which cells it has cleaned, leading to inefficiencies like revisiting cleaned areas or missing spots. Therefore, an agent with memory is likely to perform better as it can avoid revisiting cleaned cells and efficiently plan the return to home.

b.

In this version, the agent lacks bump and home sensors but has accurate location and orientation sensors. Since it always knows where it is and which direction it's facing, it can potentially operate efficiently without explicit memory. It can avoid re-cleaning by calculating its movements. Hence, a memoryless agent can potentially perform as well as a memory-equipped agent in this setup.

c.

Pseudocode for best memoryless agent in part (a):

```
IF Dirt = True THEN Suck  
ELSE IF Facing Wall THEN Turn Right  
ELSE Move Forward
```

d.

To compute the table size: Each state is a combination of (position [20 cells], orientation [4], dirt presence [2]), total = $20 \times 4 \times 2 = 160$ entries. Each entry would map to an action (Suck, Move Forward, Turn Right, Turn Left). So, a table-based agent needs 160 entries, each defining one rule.s

2. Environment Properties Analysis

Environment	Observable	Deterministic	Episodic	Static	Discrete	Single-Agent
Solitaire	Yes	Yes	Yes	Yes	Yes	Yes
Backgammon	Partially	No (due to dice)	No	Yes	Yes	No
Internet shopping	Partially	No	No	No	Yes	No
Taxi	Partially	No	No	No	Yes	No