



PRACTICE 1

INTELLIGENT AGENTS

1. For each of the following assertions, say whether it is **true or **false** and support your answer with examples or counterexamples where appropriate.**

1. An agent that senses only partial information about the state cannot be perfectly rational.
2. There exist task environments in which no pure reflex agent can behave rationally.
3. There exists a task environment in which every agent is rational.
4. The input to an agent program is the same as the input to the agent function.
5. Every agent function is implementable by some program/machine combination.
6. Suppose an agent selects its action uniformly at random from the set of possible actions. There exists a deterministic task environment in which this agent is rational.
7. It is possible for a given agent to be perfectly rational in two distinct task environments.
8. Every agent is rational in an unobservable environment.
9. A perfectly rational poker-playing agent never loses.

2. For each of the following activities, give a PEAS description of the task environment. Name the properties of each environment.

REMINDER 1: PEAS description includes:

- P: **P**erformance measure = Performance evaluation criteria
- E: **E**nvironment = Surrounding environment
- A: **A**ctuators = Components to do actions
- S: **S**ensors = Components to perceive environment

REMINDER 2: Task environments can be characterized into those that are:

- Fully observable / Partially observable / Unobservable
- Single-agent / Multi-agent
- Competitive / Cooperative (*if multi-agent*)
- Deterministic / Stochastic / Nondeterministic
- Episodic / Sequential
- Static / Dynamic
- Discrete / Continuous

2. For each of the following activities, give a PEAS description of the task environment. Name the properties of each environment.

Task environment	Performance measure	Environment	Actuators	Sensors
1. Crossword puzzle				
2. Poker agent				
3. Taxi driving				
4. Interactive tutor				
5. Cooking agent				

2. For each of the following activities, give a PEAS description of the task environment. **Name the properties of each environment.**

Task environment	Properties
1. Crossword puzzle	
2. Poker agent	
3. Taxi driving	
4. Interactive tutor	
5. Cooking agent	

3. Given the following vacuum agent, along with established assumptions. Answer the following questions.

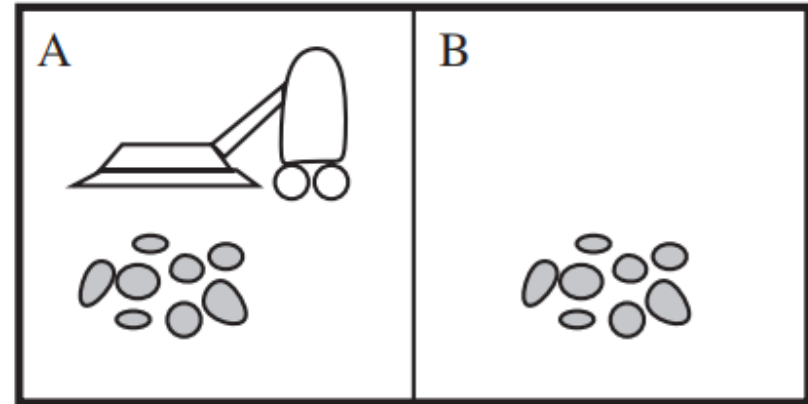
Assumptions:

- The performance measure awards one point for each clean square at each time step, over a “lifetime” of 1000 time steps.
- The “geography” of the environment is known but the dirt distribution and the initial location of the agent are not. Clean squares stay clean, and sucking cleans the current square. The **Left** and **Right** actions move the agent left and right, but never outside the environment.
- The only available actions are **Left**, **Right**, and **Suck**.
- The agent correctly **perceives its location** and whether that location **contains dirt**.

3. Given the following vacuum agent, along with established assumptions. Answer the following questions.

Given the environment, the agent function, and the given assumptions,

- (a) Show that the simple vacuum-agent function is rational.
- (b) Describe a rational agent function for the case in which **each movement costs one point**. Does the corresponding agent program require **internal state**?



function **Reflex-Vacuum-Agent**(*[location, status]*) returns an action
if *status* = *Dirty* then return *Suck*
else if *location* = *A* then return *Right*
else if *location* = *B* then return *Left*

4. Implement in pseudocode a goal-based agent.

