AI making – esercizi Cap 2

CORSO DI INTELLIGENZA ARTIFICIALE 1

R. BASILI, A.A. 2020-21

Exercises 2.2 from AIMA (3rd edition)

2.2 Let us examine the rationality of various vacuum-cleaner agent functions.

a. Show that the simple vacuum-cleaner agent function described in Figure 2.3 is indeed rational under the assumptions listed on page 38.

b. Describe a rational agent function for the case in which each movement costs one point. Does the corresponding agent program require internal state?

c. Discuss possible agent designs for the cases in which clean squares can become dirty and the geography of the environment is unknown. Does it make sense for the agent to learn from its experience in these cases? If so, what should it learn? If not, why not?

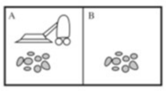

Figure 2.2 A vacuum-cleaner world with just two locations.

This leads to a **definition of a rational agent**:

For each possible percept sequence, a rational agent should select an action that is expected to maximize its performance measure, given the evidence provided by the percept sequence and whatever built-in knowledge the agent has.

Percept sequence	Action
[*A*, *Clean*]	*Right*
[*A*, *Dirty*]	*Suck*
[*B*, *Clean*]	*Left*
[*B*, *Dirty*]	*Suck*
[*A*, *Clean*], [*A*, *Clean*]	*Right*
[*A*, *Clean*], [*A*, *Dirty*]	*Suck*
⋮	⋮
[*A*, *Clean*], [*A*, *Clean*], [*A*, *Clean*]	*Right*
[*A*, *Clean*], [*A*, *Clean*], [*A*, *Dirty*]	*Suck*
⋮	⋮

Figure 2.3 Partial tabulation of a simple agent function for the vacuum-cleaner world shown in Figure 2.2.

Exercise 2.3 from AIMA (3rd edition

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

a. An agent that senses only partial information about the state cannot be perfectly rational.
b. There exist task environments in which no pure reflex agent can behave rationally.
c. There exists a task environment in which every agent is rational.
d. The input to an agent program is the same as the input to the agent function.
e. Every agent function is implementable by some program/machine combination.
f. 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.
g. It is possible for a given agent to be perfectly rational in two distinct task environments.
h. Every agent is rational in an unobservable environment.
i. A perfectly rational poker-playing agent never loses.

Exercises 2.5, 2.6 from AIMA (3rd edition)

2.5 Define in your own words the following terms: agent, agent function, agent program, rationality, autonomy, reflex agent, model-based agent, goal-based agent, utility-based agent, learning agent.

2.6 This exercise explores the differences between agent functions and agent programs.

a. Can there be more than one agent program that implements a given agent function? Give an example, or show why one is not possible.
b. Are there agent functions that cannot be implemented by any agent program?
c. Given a fixed machine architecture, does each agent program implement exactly one agent function?
d. Given an architecture with n bits of storage, how many different possible agent programs are there?
e. Suppose we keep the agent program fixed but speed up the machine by a factor of two. Does that change the agent function?

Tipologie di ambiente

	Osservabile?	Deterministico/ stocastico	Episodico/ sequenziale	Statico/ dinamico	Discreto/ continuo	Mono/ multiagente?
Gioco 15	SI	Det	Seq	Stat	Disc	Mono
Briscola						
Scacchi						
Scacchi con timer						
Sudoku						
Guida Autonoma						
Information Broker (SE)						
Diagnostica per immagini						
Alexa						

Exercises 2.9, 2.13 from AIMA (3rd edition)

2.9 Implement a simple reflex agent for the vacuum environment in Exercise 2.8. Run the environment with this agent for all possible initial dirt configurations and agent locations. Record the performance score for each configuration and the overall average score.

2.13 The vacuum environments in the preceding exercises have all been deterministic. Discuss possible agent programs for each of the following stochastic versions:

a. Murphy's law: twenty-five percent of the time, the *Suck* action fails to clean the floor if it is dirty and deposits dirt onto the floor if the floor is clean. How is your agent program affected if the dirt sensor gives the wrong answer 10% of the time?

b. Small children: At each time step, each clean square has a 10% chance of becoming dirty. Can you come up with a rational agent design for this case?

SOLUTIONS

Tipologie di ambiente

	Osservabile?	Deterministico/ stocastico	Episodico/ sequenziale	Statico/ dinamico	Discreto/ continuo	Mono/ multiagente?
Gioco 15	SI	Det	Seq	Stat	Disc	Mono
Briscola						
Scacchi						
Scacchi con timer						
Sudoku						
Guida Autonoma						
Information Broker (SE)						
Diagnostica per immagini						
Alexa						

Exercises 2.2, 2.3 from AIMA (3rd edition)

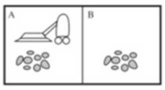

Figure 2.2 A vacuum-cleaner world with just two locations.

2.2 Let us examine the rationality of various vacuum-cleaner agent functions.

a. Show that the simple vacuum-cleaner agent function described in Figure 2.3 is indeed rational under the assumptions listed on page 38.

b. Describe a rational agent function for the case in which each movement costs one point. Does the corresponding agent program require internal state?

c. Discuss possible agent designs for the cases in which clean squares can become dirty and the geography of the environment is unknown. Does it make sense for the agent to learn from its experience in these cases? If so, what should it learn? If not, why not?

This leads to a **definition of a rational agent**:

For each possible percept sequence, a rational agent should select an action that is expected to maximize its performance measure, given the evidence provided by the percept sequence and whatever built-in knowledge the agent has.

```
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
```

Figure 2.8 The agent program for a simple reflex agent in the two-state vacuum environment. This program implements the agent function tabulated in Figure 2.3.

Percept sequence	Action
[*A*, *Clean*]	*Right*
[*A*, *Dirty*]	*Suck*
[*B*, *Clean*]	*Left*
[*B*, *Dirty*]	*Suck*
[*A*, *Clean*], [*A*, *Clean*]	*Right*
[*A*, *Clean*], [*A*, *Dirty*]	*Suck*
⋮	⋮
[*A*, *Clean*], [*A*, *Clean*], [*A*, *Clean*]	*Right*
[*A*, *Clean*], [*A*, *Clean*], [*A*, *Dirty*]	*Suck*
⋮	⋮

Figure 2.3 Partial tabulation of a simple agent function for the vacuum-cleaner world shown in Figure 2.2.