

Do the following textbook exercises from the end of Chapter 2.

- 2.3 (parts a, b, c, f, i)
- 2.4. You'll need to do two things to answer this one:
 - First, give the PEAS description for each environment: performance measure, environment, actuators, sensors.
 - Second, for each environment, characterize it according to the properties from section 2.3.2 of the book. i.e., fully observable vs partially observable, single agent vs multiagent, deterministic vs stochastic, etc..... Please organize your answer as a table, such as was done in Figure 2.6 on page 45 in the book.

- An agent is something that perceives and acts in an environment. The agent function for an agent specifies the action taken by the agent in response to any percept sequence.
- The performance measure evaluates the behavior of the agent in an environment. A rational agent acts so as to maximize the expected value of the performance measure, given the percept sequence it has seen so far.
- A task environment specification includes the performance measure, the external environment, the actuators, and the sensors. In designing an agent, the first step must always be to specify the task environment as fully as possible.
- Task environments vary along several significant dimensions. They can be fully or partially observable, single-agent or multiagent, deterministic or stochastic, episodic or sequential, static or dynamic, discrete or continuous, and known or unknown.
- The agent program implements the agent function. There exists a variety of basic agent-program designs reflecting the kind of information made explicit and used in the decision process. The designs vary in efficiency, compactness, and flexibility. The appropriate design of the agent program depends on the nature of the environment.
- Simple reflex agents respond directly to percepts, whereas model-based reflex agents maintain internal state to track aspects of the world that are not evident in the current percept. Goal-based agents act to achieve their goals, and utility-based agents try to maximize their own expected "happiness."
- All agents can improve their performance through learning.

2.2.1 Rationality

What is rational at any given time depends on four things:

- The performance measure that defines the criterion of success.
- The agent's prior knowledge of the environment.
- The actions that the agent can perform.
- The agent's percept sequence to date.

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.

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.

a. False, Page 38 talks about the Vacuum-cleaner being a rational agent even though it does not know the state of adjacent squares cleanliness.

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.

b. True.

a reflex agent does not use its precept history

So any task environment that would require the agent to use past experiences or memory would make the agent fail at behaving rationally

c. True.

any environment where all actions produce the same reward. This could include doing nothing

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.

f. True.

The same example of an environment where all actions produce the same reward would work here as well

i. A perfectly rational poker-playing agent never loses.

i. False, For many reasons.

1. Luck plays a factor in Poker

↳ Putting 2 agents against each other. no matter how perfect they play one of them will use due to bad luck.

2. bluffing and lying is hard to detect for perfect rationality.

2.4 For each of the following activities, give a PEAS description of the task environment and characterize it in terms of the properties listed in Section 2.3.2.

- Playing soccer.
- Exploring the subsurface oceans of Titan.
- Shopping for used AI books on the Internet.
- Playing a tennis match.
- Practicing tennis against a wall.
- Performing a high jump.
- Knitting a sweater.
- Bidding on an item at an auction.

Task Environment	PEAS	Observable	Single VS Multiagent	Deterministic VS Stochastic	Episodic VS Sequential	Static VS Dynamic	Discrete VS Continuous
Playing Soccer	P- Win / Loss E- Soccer Field or Stadium A- Limbs (Legs, head, etc.) S- Sensory Details (Eyes, Ears)	Partially Observable	Multiagent	Stochastic	Sequential	Dynamic	Continuous
Exploring the subsurface oceans of Titan	P- Mapped Surface Area, Life or Important things Discovered. E- subsurface oceans of Titan A- Accelerator, Break, Arm, Left and Right Steering. S- Camera, Sonar, Sensors	Partially Observable	Single Agent	Stochastic	Sequential	Dynamic	Continuous
Shopping for used AI books on the Internet	P- Cost, Quality, Accuracy E- websites that sell used books A- Accept keyboard entry and cursor clicks. S- Website interface, browser of choice	Partially Observable	Multiagent	Stochastic	Sequential	Dynamic	Continuous
Playing a tennis match	P- Win / Loss E- Tennis Court A- Tennis Racquet, Limbs (Legs, Arms) S- Sensory Details (Eyes, Ears)	Partially Observable	Multiagent	Stochastic	Sequential	Dynamic	Continuous
Practicing tennis against a wall	P- Accuracy, Performance E- A wall A- Tennis Racquet, Limbs (Legs, Arms) S- Sensory Details (Eyes, Ears)	Observable	Single Agent	Stochastic	Sequential	Dynamic	Continuous
Performing a high jump	P- Cleared or not Cleared E- High Jump Arena A- Body S- Eyes	Observable	Single Agent	Stochastic	Sequential	Dynamic	Continuous
Knitting a sweater	P- Quality E- Chair? A- Hands, Needle, Yarn S- Eyes, Picture of sweater maybe?	Observable	Single Agent	Stochastic	Sequential	Dynamic	Continuous
Bidding on an item at an auction	P- Item bought, Price Paid E- Website or Place of Auction A- Bidding S- Eyes, Ears	Partially Observable	Multiagent	Stochastic	Episodic	Dynamic	Continuous

Unknown vs Known

Unknown

Unknown

Unknown

Unknown

Unknown

Unknown

Unknown

Known