Homework 1

100 Total Points

Assigned on: Monday, August 29th, 2022.

Due: Friday, September 9th, 2022.

Submission: As you wish: handwritten, typewritten, right before class, or on handin.

Exercises: AIMA exercises are available online : "https://aimacode.github.io/aima-exercises"

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1   Research   25 points

Every year the Loebner prize is awarded to the program that comes closest to passing a version of the Turing test. Research the Loebner prize and the Turing test. Report on the latest winner of the Loebner prize. What techniques does it use? How does it advance the state of the art in AI? etc.

2   Chapter 1, Exercise 9, Source: AIMA online site.
16 points

To what extent are the following computer systems instances of artificial intelligence:

- Supermarket bar code scanners.

- Web search engines.

- Voice-activated telephone menus.

- Internet routing algorithms that respond dynamically to the state of the network.

3   Chapter 2, Exercise 4, Source: AIMA online site.
27 points

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.

4 Chapter 2, Exercise 5 (a,b,c) (Adapted), Source: AIMA online site. 10 points

1. For each of the agent types listed below, characterize its performance measure, environmeant, actuators and sensors according to the properties given in
Section 2.3: 5 points

   - Robot soccer player
   - Internet book-shopping agent
   - Autonomous Mars rover

2. Then characterize the environment according to the properties given in Section 2.3 (AIMA), and select a suitable agent design. 5 points

5 Chapter 2, Exercise 8 (a,b) , Source: AIMA online site. 10 points

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

1. Can there be more than one agent program that implements a given agent function? Give an example, or show why one is not possible.

2. Are there agent functions that cannot be implemented by any agent program?

6 Chapter 2, Exercise 13, Source: AIMA online site. 12 points

Note: You do not need to design an agent in part B.

Consider a modified version of the vacuum-cleaner environment where the agent is penalized one point for each movement.

1. Can a simple reflex agent be perfectly rational for this environment? Explain.

2. What about a reflex agent with state? Design such an agent.

3. How do your answers to 1 and 2 change if the agent's percepts give it the clean/dirty status of every square in the environment?