

01.08 Exercises for Chapter 01

Exercise 01.1

Classify each of the following as robot or not-robot. If it is not a robot, list the missing qualities. Comment on ambiguities.

- a. A conveyor belt that maintains a constant speed regardless of load.
- b. A remotely controlled unmanned aerial vehicle (UAV).
- c. A simulated spaceship.
- d. A raven.
- e. A high-speed train.

Exercise 01.2

For each of the types of robots described below, list at least one potential actuator, effector, and behavior.

- a. A self-driving truck.
- b. A small, insect-like aerial robot.
- c. A manufacturing robot that sands parts.

Exercise 01.3

For each of the robot behaviors below, list three useful sensors.

- a. Flying through air.
- b. Driving across bumpy terrain.
- c. Swimming through water.
- d. Pouring a glass of whiskey.
- e. Folding a shirt.

Exercise 01.4

For each of the robot-action pairs described below, describe a specific potential actuator and effector.

- a. A mobile robot lifting a crate from the ground to a shelf at a height of 3 m.
- b. A stationary manipulator robot painting a car.
- c. A small mobile robot hopping up stairs.

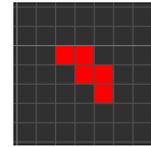
Exercise 01.5

Write a one- or two-sentence response to each of the following questions and imperatives.

- a. Why must robot action maps be performant to be considered intelligent?
- b. What is machine learning?
- c. Apply the definition of intelligence to the following system to determine if it is intelligent: a control system that rotates a link at a constant rate, regardless of load.

Exercise 01.6

Play a standard Conway's Game of Life on paper, starting with the configuration shown. How many generations does it take to develop a static pattern, and what is that static pattern?

**Exercise 01.7**

Write a one- or two-sentence response to each of the following questions and imperatives.

- a. What are some aspects of a self-driving car that are autonomous? Explain why!
- b. Classify each of the following as human-robot collaboration or not. Explain why!
 - i. A manufacturing process in which a human builds a robot performs a task, then, separately, the robot performs a task.
 - ii. A manufacturing process in which a human and a robot perform parts of the same tasks, simultaneously, in the same space.
 - iii. A drone with autopilot and a remote human actuating cameras aboard the drone.
 - iv. A team of five drones and two humans searching a disaster area for survivors, with the drones giving the humans additional views of hard-to reach areas.
 - v. A robot crawling through a tight space with a human operator that has some control, but who is overridden when the robot deems a command from the operator to be dangerous.

- c. Why is it that robots are probably better when they aren't "fully" autonomous?