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572 - Principle of Artificial Intelligence

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Problem Set 2

(20 points)

1. (20 pts.) Chapter 3 Exercises 8.2 (A 3-foot-tall monkey ...) and 8.4 (You have three jugs ...) at <https://aimacode.github.io/aima-exercises/search-exercises/>.

Exercise 8

Give a complete problem formulation for each of the following. Choose a formulation that is precise enough to be implemented.

2. A 3-foot-tall monkey is in a room where some bananas are suspended from the 8-foot ceiling. He would like to get the bananas. The room contains two stackable, movable, climbable 3-foot-high crates.

This is a goal-based agents' problem once we can assume the environment is fully observable, deterministic, static, and discrete, and can be executed with a single-agent.

Initial State:

- The room has an 8-foot ceiling.
- The bananas are suspended from the ceiling.
- The room contains two stackable, movable, climbable 3-foot-high crates in a specific location.
- The Monkey is in the room on the floor and hasn't gotten any bananas yet.

Actions:

- Monkey can move to different places within the room.
- Stack each crate up or down.
- Move each crate to the right, left, upward, or backward.
- Climb each crate.
- Step the crate up or down.
- Grab the banana.

Goal:

- The monkey gets his bananas with the least actions possible

Action Cost:

- The action cost can be 1 per action. In the end, the total count of moves the agent (monkey) had taken to get his bananas will determine its performance and be used to optimize its performance on reaching the described goal above.

4. You have three jugs, measuring 12 gallons, 8 gallons, and 3 gallons, and a water faucet. You can fill the jugs up or empty them out from one to another or onto the ground. You need to measure out exactly one gallon.

This is a goal-based agents' problem once we can assume the environment is fully observable, deterministic, static, and discrete(can be continuous if the water faucet is open) and can be executed with a single-agent.

Initial State:

- There are 3 jugs measuring 12, 8, 3 gallons.
- The jugs are on the floor in front of the water faucet.
- The jugs start empty.
- There's 1 water faucet.
- The water faucet is on the wall.
- The agent is on the floor in front of the jugs.

Actions:

- The agent can move in any direction within the parameter.
- The agent can open and close the water faucet.
- The agent can move the jugs to the right, left, upward, and backward.
- The agent can grab the jugs being full or empty and use to fill or empty the other jugs.

Goal:

- The agents must measure out exactly one gallon.

Action Cost:

- The action cost can be 1 per action. In the end, the total count of moves the agent had taken to measure out exactly one gallon will determine its performance and be used to optimize its performance on reaching the described goal above.