

**PROMPT**

Create an MDP. Remember to describe the states, actions and rewards. Make sure your three MDPs are different from each other.

**Robotic Vacuum Cleaner for Home**

States: Current location (living room, kitchen, bedroom), floor condition (clean, dirty), whether there are obstacles in front, and battery level (full, medium, low).

Actions: Move forward, turn left, turn right, vacuum, return to charging station.

Rewards:

+10 points for vacuuming in dirty areas,

-5 points for colliding with obstacles,

+5 points for returning to charging when battery is low,

-1 point for moving around without doing anything useful.

Explanation: The robot must learn how to optimize cleaning while saving battery and avoiding collisions. Rewards help guide the robot's behavior toward that goal.

## RUBRIC

Did the learner describe an MDP, and is it different than their other submissions?

☐ 0 points  
No

☒ **1 point**  
Yes

Are the **states** well-specified? Namely are they Markov and so can be used as MDP states.

☐ 0 points  
No

☒ **1 point**  
Yes

Are the **actions** well-specified? Namely can they be used as actions in an MDP.

☐ 0 points  
No

☒ **1 point**  
Yes

Are the **rewards** well-specified? Namely to satisfy the requirements in the definition of an MDP with the described state and action set.

☐ 0 points  
No

☒ **1 point**  
Yes

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## Students preparing for exams

States: Mental state (focused, tired, distracted), time of day (morning, afternoon, evening), and time remaining until exam.

Actions: Study, break, sleep, phone use, review.

Rewards:

+10 points for each effective study session while focused,

-5 points for using phone when studying,

+7 points for sleeping at the right time to restore energy,

+3 points for taking a reasonable break when tired.

Explanation: Students need to balance between studying and resting. Rewards reflect effective use of time and energy management.

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Autonomous Vehicle at an Intersection

States: Traffic light (red, green, yellow), pedestrians, vehicles nearby, and weather conditions (sunny, rainy).

Actions: Braking, accelerating, turning left, turning right, honking, stopping.

Rewards:

+10 points for safely passing the intersection when the light is green,

-10 points for running a red light,

+5 points for stopping in time when there are pedestrians,

-5 points for not reacting to other vehicles or causing danger.

Explanation: The goal of an autonomous vehicle is to ensure traffic safety. Rewards encourage law-abiding behavior and appropriate responses to the environment.

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