Homework 2 - Choice of a Robot Vacuum

Oct 05, 2022

In this homework assignment you are going to calculate the expected utility of an action in a partially observable environment.

One day

Imagine you are controlling an AI robot vacuum responsible for cleaning a corridor. However, you inspect its battery level to find out that it is in the low-battery mode.

You have two choices: one is to head back to the charging station and give up the task; the other is to continue picking up the trash. If you choose to charge, the robot has 90% chance to fully charge and 10% chance to shut down. If you choose to continue working, the robot has 70% chance to shut down and 30% chance to complete the task. Completing the task gives you a utility of 80; Shutting down gives you a utility of -100; Fully charging the battery gives you a utility of -10. You need to make the choice now.

1. Answer the questions

1) What is the current state s?
2) What are the actions available?
3) What are the next states s'?
4) What is the expected utility of each action?
5) Which action should you choose?

On another day

You get an alert when inspecting the battery of the robot. The alert says that you have a 80% chance to be in the low-battery mode and 20% chance to be in the high-battery mode. The low-battery mode is the same as in the section "One day". In the high-battery mode, if you choose to charge, the robot has 100% probability to fully charge; if you choose to continue working, the robot has 20% chance to shut down and 80% chance to complete the task. You need to make the choice: Do I want to charge or continue working?

2. Answer the questions

6) What can possibly be the current state?
7) What are the actions available?
8) When you choose to continue working, what is the probability that the robot will shut down?
9) What is the expected utility of each action?
10) Which action should you choose?

Submission

Please submit a completed *utility_YourLastName_YourFirstName.pdf* file on Canvas before due. **The due date and time of this homework assignment is Tuesday, 10/11/2022 11:59pm**. Show your calculation process. Do not submit any code.