Homework 2 - Choice of a Robot Vacuum

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1 1) The current state s is cleaning the corridor.

2) There are two available actions, one is to head back to the charging station and give up the task; the other is to continue the task of picking up the trash.

3) The next states s' are either the robot being fully charged, the robot shut down, or the robot complete the task.

4)

$$EU(headback) = 0.9 \cdot -10 + 0.1 \cdot -100 = -19$$
$$EU(continue) = 0.7 \cdot -100 + 0.3 \cdot 80 = -46$$

5) The robot should go back to charging station since the action will lead to maximum expected utility.

2 6) The current state of the robot is cleaning the corridor.

7) The available actions are still whether the robot should go back to the charging station or continue the task.

8)

$$\begin{aligned} P(shutdown|continue) &= P(shutdown|continue, low-battery) \cdot P(low-battery) + P(shutdo \\ &= 0.7 \cdot 0.8 + 0.2 \cdot 0.2 \\ &= 0.56 + 0.04 = 0.6 \end{aligned}$$

9)

$$\begin{aligned} P(headback) &= 0.8 \cdot (0.9 \cdot -10 + 0.1 \cdot -100) + 0.2 \cdot (1 \cdot -10) \\ &= 0.8 \cdot -19 + 0.2 \cdot -10 \\ &= -17.2 \end{aligned}$$

$$\begin{aligned} P(continue) &= 0.8 \cdot (0.7 \cdot -100 + 0.3 \cdot 80) + 0.2 \cdot (0.2 \cdot -100 + 0.8 \cdot 80) \\ &= 0.8 \cdot -46 + 0.2 \cdot 44 \\ &= -28 \end{aligned}$$

10) The robot should still head back to the charging station since it will have greater expected utility.