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Chua, Aaron Eldrich L. COM221

1. Define a Markov Decision Process (MDP). List its key components

MDP is when something doesn't rely on the past. What only matters is the present, even though the past has happened to the environment what we focus on is only the present. the Key components include the agent, the environment, the actions, rewards, state, and sometimes the existence of the policy

2. What does it mean for a process to satisfy the Markov property?

The current state gives enough information for us to determine its sequence.

3. Explain the difference between a policy and a value function.

the difference between a policy and a value function is that in policy it only focuses on the current state and as to how the agent acts. while with value function looks at the future and what its value of state will be.

4. What is the role of the discount factor (γ) in an MDP?

- What happens when $\gamma = 0$ and when $\gamma \to 1$?

Discount factor factor plays a huge role on how we calculate the total rewards that an agent may get, if we make $\gamma \to 1$ each step will not go high especially when the terminal state is still far so when $\gamma \to 0$ nothing limits the rewards and each step will just contribute to the total reward gained without anything limiting it.

5. Two - State weather MDP

(a) Compute the average expected reward for Sunny

$r\pi = 0.5 \times (2) + 0.5 \times (0) = 1 + 0 = \boxed{1}$

(b) Compute the average expected reward for Rainy

$r\pi = 0.5 \times (1) + 0.5 \times (3) = 0.5 + 1.5 = \boxed{2}$

(c) Using the bellman expectation equation, solve for v_π (sunny)

$V_1 = 1 + 0.5(1.0\, v_1 + 1.0\, v_2)$

$v_1 = 1 + 1.5 v_2$ $\boxed{V\pi = 2.687}$

(d) Using the bellman expectation equation, solve for v_π (Rainy)

$V_2 = 2 + 0.5(1.0 v_1 + 0.0 v_2)$

$V_2 = 2 + 0.5 v_1$ $\boxed{V\pi = 3.33}$

Solution at the back

VICTORY

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$0.0V_1 - 0.5V_2 = 1$

$V_1 = 1 + 0.5V_2$

~~$V_2 = 2 + 0.5(1 + 0.5)$~~

~~$V_2 = 2 + (0.5)(0.75)$~~

~~$\frac{0.75V^2}{0.75} = \frac{2.5}{0.75}$~~

~~$V^2 = 3.33$~~

$V_2 = 2 + 0.5(1 + 0.0)$

$V_2 = 2 + 0.5V_1$

$V_2 = 2 + 0.5V_1$

$V_2 = 2 + 0.5(1 + 0.5V_2)$

$V_2 = 2 + (0.5 + 0.25V_2)$

$\frac{0.75V^2}{0.75} = \frac{2.5}{0.75}$

$V^2 = 3.33$

$V_1 = 1 + 0.5V_2$

$V_1 = 1 + 0.5(3.33) =$

$V_1 = 1 + 1.666 = 2.666$

Sunny = 2.666

Midterm Exam

Chua, Aaron Eldrech L. CSM221

6) 1. $V_{k+1}(A) = \frac{1}{4} = [(-1+v(A)) + (-1+v(B)) + (-1+v(D)) + (-1+(v(A))]$
$\frac{1}{4}[(-1+0) + (-1+0) + (-1+0) + (-1+0)]$
$= -1$

2. $V_{k+1}(B) = \frac{1}{4} = [(-1+v(A)) + (-1+v(C)) + (-1+v(B)) + (-1+v(B))$
$\frac{1}{4} = [(-1+0) + (-1+0) + (-1+0) + (-1+0)]$
$= -1$

3. $V_{k+1}(C) = \frac{1}{4} = ((-1+v(B)) + (-1+v(C)) + (-1+v(C)) + (-1+v(F)))$
$\frac{1}{4} = [(-1+0) + (-1+0) + (-1+0) + (-1+0)]$
$= -1$

4 $V_{k+1}(D) = \frac{1}{4} = [(-1+v(A)) + (-1+v(D)) + (-1+v(G)) + (-1+v(D))$
$\frac{1}{4} = [(-1+0) + (-1+0) + (-1+0) + (-1+0)$
$= -1$

5 $V_{k+1}(F) = \frac{1}{4} = [(-1+v(C)) + (-1+v(F)) + (-1+v(F))]$
$\frac{1}{4} = [(-1+0) + (-1+0) + (-1+0)]$
$= -1$

6. $V_{k+1}(G) = \frac{1}{4} = [-1+v(D)) + (-1+v(H)) + (-1+v(G)) + (-1+v(G))]$
$\frac{1}{4} = [(-1+0) + (-1+0) + (-1+0) + (-1+0)]$
$= -1$

7. $V_{k+1}(H) = \frac{1}{4} = [-1+v(H)) + (-1+v(G)) + (-1+v(H))]$
$\frac{1}{4} = [(-1+0) + (-1+0) + (-1+0)]$
$= -1$

8 -1 -1 -1
-1 -1
-1 -1 Terminal

9. $q_{k+1}(A, Left) = -2$ $q_{k+1}(B, Left) = -2$ $q_{k+1}(C, Left) = -2$
$q_{k+1}(A, Right) = -2$ $q_{k+1}(B, Right) = -2$ $q_{k+1}(C, Right) = -2$
$q_{k+1}(A, Up) = -2$ $q_{k+1}(B, Up) = -2$ $q_{k+1}(C, Up) = -2$
$q_{k+1}(A, Down) = -2$ $q_{k+1}(B, Down) = -2$ $q_{k+1}(C, Down) = -2$
$q_{k+1}(D, Left) = -2$ $q_{k+1}(F, Left) = -2$ $q_{k+1}(G, Left) = -2$
$q_{k+1}(D, Right) = -2$ $q_{k+1}(F, Right) = -2$ $q_{k+1}(G, Right) = -2$
$q_{k+1}(D, Up) = -2$ $q_{k+1}(F, Up) = -2$ $q_{k+1}(G, Up) = -2$
$q_{k+1}(D, Down) = -2$ $q_{k+1}(F, Down) = -1$ $q_{k+1}(G, Down) = -2$

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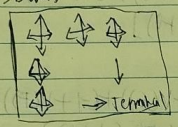
$q_{k+1}(H, Left) = -2$
$q_{k+1}(H, Right) = -1$
$q_{k+1}(H, Up) = -2$
$q_{k+1}(H, Down) = -2$



k+1

1. $V_{k+1}(A) = [(-1 + V(A)) + (-1 + V(B)) + (-1 + V(D)) + (-1 + V(G))]$
$V_{k+1}(A) = [(-1 + -1) + (-1 + -1) + (-1 + -1) + (-1 + -1)]$
$= -2$

2. $V_{k+1}(B) = [(-1 + V(A)) + (-1 + V(B)) + (-1 + V(C)) + (-1 + V(E))]$
$= [(-1 + -1) + (-1 + -1) + (-1 + -1) + (-1 + -1)]$
$= -2$

3. $V_{k+1}(C) = [(-1 + V(B)) + (-1 + V(C)) + (-1 + V(F)) + (-1 + V(I))]$
$= [(-1 + -1) + (-1 + -1) + (-1 + -1) + (-1 + -1)]$
$= -2$