RL ASSIGNMENT - DARIDO, SERILLI

STEP 0

$$R = \begin{array}{c} \begin{matrix} 0 & 1 & 2 & 3 & 4 & 5 \end{matrix} \\ \text{ACTIONS} \\ \begin{bmatrix} -1 & -1 & -1 & -1 & 0 & -1 \\ -1 & -1 & -1 & 0 & -1 & 100 \\ -1 & -1 & -1 & 0 & -1 & -1 \\ -1 & 0 & 0 & -1 & 0 & -1 \\ 0 & -1 & -1 & 0 & -1 & 100 \\ -1 & 0 & -1 & -1 & 0 & 100 \end{bmatrix} \end{array} \begin{matrix} 0 \\ 1 \\ 2 \\ 3 \\ 4 \\ 5 \end{matrix} \quad \text{STATES}$$

STEP 1

$\gamma = 0.8$

$$Q = \begin{bmatrix} 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 \end{bmatrix}$$

STEP 2

EPISODE 1

$Q(1,5) = R(1,5) + \gamma \cdot \max\{Q(5,5), Q(5,1), Q(5,4)\} = 100 \Rightarrow Q =$

$$\begin{bmatrix} 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 100 \\ 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 \end{bmatrix}$$

STEP 3

EPISODE 2

$Q(3,1) = R(3,1) + \gamma \cdot \max\{Q(1,5), Q(1,3)\} = 80 \Rightarrow Q =$

$$\begin{bmatrix} 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 100 \\ 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 80 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 \end{bmatrix}$$

$Q(1,5) = 100$

STEP 4

EPISODE 3

$Q(4,5) = R(4,5) + \gamma \cdot \max\{Q(5,5), Q(5,1), Q(5,4)\} = 100 \Rightarrow Q =$

$$\begin{bmatrix} 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 100 \\ 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 80 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 100 \\ 0 & 0 & 0 & 0 & 0 & 0 \end{bmatrix}$$

EPISODE 4

$Q(3,4) = R(3,4) + \gamma \cdot \max\{Q(4,5), Q(4,3), Q(4,0)\} = 80 \Rightarrow$

$Q(4,5) = 100$

$Q =$

$$\begin{bmatrix} 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 100 \\ 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 80 & 0 & 0 & 80 & 0 \\ 0 & 0 & 0 & 0 & 0 & 100 \\ 0 & 0 & 0 & 0 & 0 & 0 \end{bmatrix}$$

EPISODE 5

$Q(2,3) = R(2,3) + \gamma \max\{Q(3,1), Q(3,4), Q(3,2)\} =$

$= 0 + 0.8 \cdot 80 = 64 \Rightarrow$

$Q(3,1) = 80$

$Q(1,5) = 100$

$$Q = \begin{bmatrix} 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 100 \\ 0 & 0 & 0 & 64 & 0 & 0 \\ 0 & 80 & 0 & 0 & 80 & 0 \\ 0 & 0 & 0 & 0 & 0 & 100 \\ 0 & 0 & 0 & 0 & 0 & 0 \end{bmatrix}$$

EPISODIO 6

$Q(0,4) = R(0,4) + \gamma \cdot \max\{Q(4,3), Q(4,5), Q(4,0)\}$

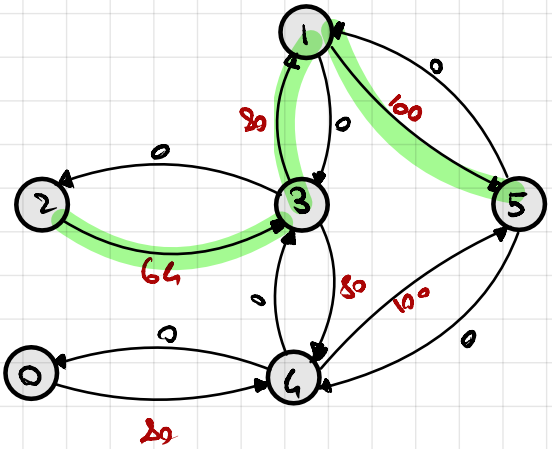
$= 0 + 0.8 \cdot 100 = 80 \Rightarrow$

$Q(4,5) = 100$

$$Q = \begin{bmatrix} 0 & 0 & 0 & 0 & 80 & 0 \\ 0 & 0 & 0 & 0 & 0 & 100 \\ 0 & 0 & 0 & 64 & 0 & 0 \\ 0 & 80 & 0 & 0 & 80 & 0 \\ 0 & 0 & 0 & 0 & 0 & 100 \\ 0 & 0 & 0 & 0 & 0 & 0 \end{bmatrix}$$

STEP 5

- The best sequence to reach the GOAL from 2 is the following:



$$Q = \begin{bmatrix} 0 & 0 & 0 & 0 & 80 & 0 \\ 0 & 0 & 0 & 0 & 0 & 100 \\ 0 & 0 & 0 & 64 & 0 & 0 \\ 0 & 80 & 0 & 0 & 80 & 0 \\ 0 & 0 & 0 & 0 & 0 & 100 \\ 0 & 0 & 0 & 0 & 0 & 0 \end{bmatrix}$$