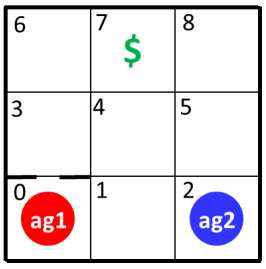
Homework 4

Due: June 21, 18:00

Problem 1. (Stochastic game for simplified grid game)

Consider the following stochastic game with two players $n = 1,2$.



Game's rule:

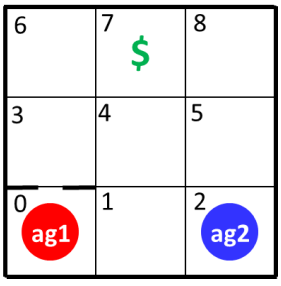
-Refer the lecture note "22. Stochastic Game with Nash Equilibrium concept"

-Note that there is only one semi wall at the lower-left corner.

(1) Find the Nash equilibrium policies $\pi^* = (\pi_1^*, \pi_2^*)$ such that for all $s \in S$ and $i = 1, \dots 2$,

$$V_i(s, \pi_i^*, \pi_{-i}^*) \geq V_i(s, \pi_i^*, \pi_{-i}^*) \quad \text{for all } \pi_i \in \Pi_i$$

You can draw the Nash equilibrium trajectories for the two player (you don't have to show the computation procedure). Draw your found Nash Trajectory on the bellow figure



(2). Compute $V_1((0,2), \pi_1^*, \pi_2^*)$ and $V_2((0,2), \pi_1^*, \pi_2^*)$ using the Nash equilibrium strategies $\pi^* = (\pi_1^*, \pi_2^*)$ you found in problem (1).

(3). Compute the Nash Q values, $Q_1^*(s_0, a_1,\ a_2)$ and $2(s_0, a_1,\ a_2)$ for the two players at **the starting state** $s_0 = (0,2)$.

		Player 2's action a_2			
		Up	Down	Left	Right
Player 1's action a_1	Up	$Q_1^*(s_0, a_1,\ a_2) =$ $Q_2^*(s_0, a_1,\ a_2) =$			
	Down				
	Left				
	Right				

(4). Compute Nash equilibria for the above stochastic game $\{Q_1^*(s_0, a_1,\ a_2), Q_2^*(s_0, a_1,\ a_2)\}$. What is the Nash equilibrium actions and Nash equilibrium values? are these values correspond to those you found in problem (2)?

Problem 2. (Individual Q-learning for Stochastic Games)

Refer the uploaded “HW4_Code_Assigment.ipynb” file

Problem 3. (Nash Q-learning for Stochastic Games)

Refer the uploaded “HW4_Code_Assigment.ipynb” file