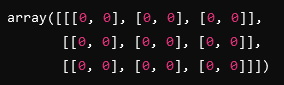
**Pong con Q-Learning:**

Clase PongEnviroment:

* Action\_space = [arriba, abajo]
* \_step\_penalization = number
* State= [0,0,0]
* Total\_reward = number
* Dx = movimiento\_px
* Dy = movimiento\_px
* Positions\_space = Array de filas x filas x columnas. Ejemplo de 3 x 3 x 2



* Lives = vidas actuales. Inicia en max\_life
* Max\_life = vidas máximas a perder
* X = numero aleatorio entre width/2 y width. Refiere a la posición inicial de la pelota
* Y = numero aleatorio entre 0 y height-10. Refiere a la posición inicial de la pelota
* Player\_alto = altura de la barra del jugador. Es height/4
* Player1 = posición inicial del player
* Score = inicializa en 0
* Width\_px
* Height\_px
* Radio

Clase PongAgent:

* \_q\_table = guarda la tabla de valores Q

A diagram of a robot and a sign

Description automatically generated

A black symbols on a white background

Description automatically generated

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | 0 | | 1 | | 2 | | 3 | | 4 | | 5 | | 6 | | 7 | |
| x | y | x | y | x | y | x | y | x | y | x | y | x | y | x | y |
| 0 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 1 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 2 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 3 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 4 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 5 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 6 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 7 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |

**Links:**

Simple example: <http://firsttimeprogrammer.blogspot.com/2016/09/getting-ai-smarter-with-q-learning.html>

Simple example 2.0 video: <https://www.youtube.com/watch?v=nSxaG_Kjw_w&list=UUq4pm1i_VZqxKVVOz5qRBIA&index=2&ab_channel=AITourist-TechMeanderings>

Simple example 2.0: <https://amunategui.github.io/reinforcement-learning/index.html>

<https://medium.com/aprendizaje-por-refuerzo-introducci%C3%B3n-al-mundo-del/aprendizaje-por-refuerzo-introducci%C3%B3n-al-mundo-del-rl-1fcfbaa1c87>

<https://markelsanz14.medium.com/introducci%C3%B3n-al-aprendizaje-por-refuerzo-parte-1-el-problema-del-bandido-multibrazo-afe05c0c372e>

<https://markelsanz14.medium.com/introducci%C3%B3n-al-aprendizaje-por-refuerzo-parte-2-q-learning-883cd42fb48e>

<https://www.aprendemachinelearning.com/aprendizaje-por-refuerzo/>

<https://github.com/jbagnato/machine-learning/blob/master/Ejercicio_Reinforcement_Learning_Pong.ipynb>

<https://www.freecodecamp.org/espanol/news/introduccion-a-q-learning-aprendizaje-por-refuerzo/>

<https://blog.adrianistan.eu/reinforcement-learning-aprendizaje-refuerzo-mdp-bellman-2>