Artificial Intelligence Lab 11: Q-learning

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Q1) Implement the following iteration :

$$x_{t+1} = x_t + \alpha_t(y_t - x_t) \tag{1}$$

, where $x_t \in \mathbb{R}$, y_t is a random variable, and $\alpha_t > 0$ is a step-size. Let us understand how this works by changing the step-size and the random variable:

25 Marks Keep $\alpha_t = 0.1, 0.01, 0.001$ and then

1. y_t is a uniform in $[-1, 1]$. Plot x_t.
2. y_t is a uniform in $[0, 1]$. Plot x_t.

25 Marks Keep $\alpha_t = 1/(t+1)$, $\alpha_t = \frac{c}{t+c'}$ for some $c, c' > 0$, and then

1. y_t is a uniform in $[-1, 1]$. Plot x_t.
2. y_t is a uniform in $[0, 1]$. Plot x_t.

For all the above cases, plot x_t.

Q2) Implement value iteration for grid world with Q values. Same as previous lab second question, however use the 2-D array namely Q-values. [30 Marks]

Q3) Implement Q-learning for grid world. [20 Marks]