Reinforcement Learning
Exercise 5

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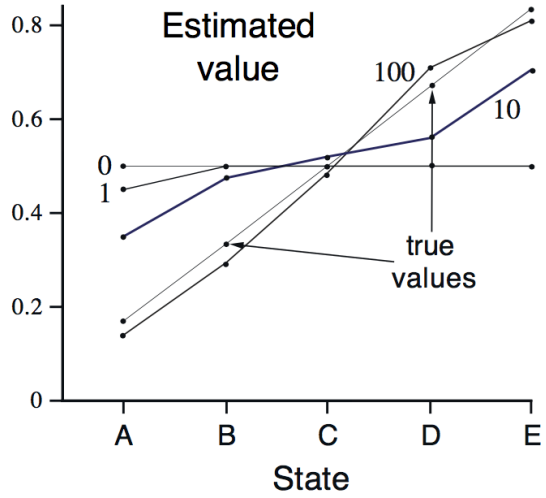
1 Random Walk (2P)



Recall the Random walk example presented in the lecture (lecture 5 slide 12). From the results shown in the right graph above (estimated value) it appears that the first episode results in a change in only V(A). What does this tell you about what happened on the first episode? Why was only the estimate for this one state changed? By exactly how much was it changed (assuming $\alpha = 0.1$)? Support your answers by computing the TD-update.

2 Sarsa and Q-learning on the FrozenLake (8P)

We will again use the FrozenLake environment from gym (`https://www.gymlibrary.dev/environments/toy_text/frozen_lake/`). The code template can be found on Ilias in *ex05-td/ex05-td.py*. It has been tested with gym version 0.18.0 (but should also be stable with version 0.18.3).

a) Implement Sarsa and obtain and plot the state-value function, action-value function, and policy for the FrozenLake environment. Plot the average episode length as training continues. (3P)

b) Implement Q-learning and obtain and plot the optimal state-value function, action-value function, and policy for FrozenLake. What can you say about performance during training in comparison to the performance of the optimal policy? (3P)

c) Explore how your results for a) and b) change if you switch to the non-slippery version (i.e. deterministic environment). (1P)

d) Rerun your code for the larger FrozenLake environment. (1P)