

COMP 4900 Assignment 3

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1.

Here are the results of the simulation:

Number of states required was found using binary search for an accuracy of 95%

Exact accuracy was found using the following formula.

The image shows a handwritten formula for $b_1(a)$. It is written as:

$$b_1(a) = \frac{1 + \left(\frac{c_1}{c_2}\right)^N \frac{c_1 - d_1}{c_2 - d_2} \frac{(c_2^N - d_2^N)}{(c_1^N - d_1^N)}}{1 + \left(\frac{c_1}{c_2}\right)^N \frac{c_1 - d_1}{c_2 - d_2} \frac{(c_2^N - d_2^N)}{(c_1^N - d_1^N)}}$$

Simulated accuracy was found using time and ensemble average, I ran 100 experiments, for every experiment I assumed convergence after 10,000 iterations, and counter 1000 actions after convergence.

$c=[0.05, 0.7]$ Number of states required: 2 Exact accuracy: 0.9949 Simulated: 0.9951

$c=[0.15, 0.7]$ Number of states required: 2 Exact accuracy: 0.9560 Simulated: 0.9583

$c=[0.25, 0.7]$ Number of states required: 3 Exact accuracy: 0.9575 Simulated: 0.9570

$c=[0.35, 0.7]$ Number of states required: 5 Exact accuracy: 0.9661 Simulated: 0.9647

$c=[0.45, 0.7]$ Number of states required: 9 Exact accuracy: 0.9531 Simulated: 0.9535

$c=[0.55, 0.7]$ Number of states required: ∞ Exact accuracy: 0.7999 Simulated: 0.8049

$c=[0.65, 0.7]$ Number of states required: ∞ Exact accuracy: 0.57142 Simulated: 0.5775

For the last two cases, since c_{\min} isn't ≤ 0.5 , reaching 95% accuracy is impossible even with infinite states.

2.

Using environment $n=6$ $c=[0.98, 0.99]$ for Krylov, and $c=[0.49, 0.495]$ for Tsetlin, these are the results:

Exact accuracy using formula from question 1: 0.5154

Tsetlin with $c=[0.49, 0.495]$ Simulated: 0.51974

Krylov with $c=[0.98, 0.99]$ Simulated: 0.51704

3.

Here are the results of the simulation:

λ_R was found using binary search for an accuracy of 95%

Accuracy was found by simulating 1000 experiments and counting number of times P converges to action 1/2

$c=[0.05, 0.7]$	$\lambda_R = 0.3928$	steps: 13.262
$c=[0.15, 0.7]$	$\lambda_R = 0.3622$	steps: 17.251
$c=[0.25, 0.7]$	$\lambda_R = 0.3163$	steps: 23.326
$c=[0.35, 0.7]$	$\lambda_R = 0.255$	steps: 36.228
$c=[0.45, 0.7]$	$\lambda_R = 0.2014$	steps: 61.636
$c=[0.55, 0.7]$	$\lambda_R = 0.1325$	steps: 151.883
$c=[0.65, 0.7]$	$\lambda_R = 0.0559$	steps: 904.821