Στοχαστικές Ανελίξεις
SET 1

Νικόλαος Ζαρίφης ID: 03112178

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Άσκηση 1

Σταν άσκηση είχαμε υπολογίσει ότι η πιθανότητα είναι περίπου ίση με 0,04 , εδώ πέρα τρέχοντας το πρόγραμμα βλέπουμε διαφορά αποτελέσματα, αρκετά κοντά στο αποτέλεσμα όμως υπάρχει σφάλμα ίσο με 10^2 το πολύ.Ενδείκτηκα τα αποτελέσματα είναι:

```
We executed 1000  times the first 20 steps of the markov chain and we captured the running
45 times
So we estimate the Pr[X_(20) in 1|X_1 = 1] by 0.045
We executed 1000  times the first 20 steps of the markov chain and we captured the running
44 times
So we estimate the Pr[X_(20) in 1|X_1 = 1] by 0.044
We executed 1000  times the first 20 steps of the markov chain and we captured the running
43 times
So we estimate the Pr[X_(20) in 1|X_1 = 1] by 0.043
We executed 1000  times the first 20 steps of the markov chain and we captured the running
44 times
So we estimate the Pr[X_(20) in 1|X_1 = 1] by 0.044
We executed 1000  times the first 20 steps of the markov chain and we captured the running
39 times
So we estimate the Pr[X_(20) in 1|X_1 = 1] by 0.039
We executed 1000  times the first 20 steps of the markov chain and we captured the running
43 times
So we estimate the Pr[X_(20) in 1|X_1 = 1] by 0.043
We executed 1000  times the first 20 steps of the markov chain and we captured the running
36 times
So we estimate the Pr[X_(20) in 1|X_1 = 1] by 0.036
We executed 1000  times the first 20 steps of the markov chain and we captured the running
38 times
So we estimate the Pr[X_(20) in 1|X_1 = 1] by 0.038
We executed 1000  times the first 20 steps of the markov chain and we captured the running
48 times
So we estimate the Pr[X_(20) in 1|X_1 = 1] by 0.048
We executed 1000  times the first 20 steps of the markov chain and we captured the running
46 times
So we estimate the Pr[X_(20) in 1|X_1 = 1] by 0.046
```

Άσκηση 2

Αλλάζοντας στο πρόγραμμα την μεταβλήτη N κι θετωντάς την ίση με 100000 αναμένουμε καλύτερο αποτέλεσμα (Νομος Μεγάλων αριθμών).Έχουμε το ακόλουθο αποτελέσμα:

```
We executed 100000  times the first 20 steps of the markov chain and we captured the runnir
4111 times
So we estimate the Pr[X_(20) in 1|X_1 = 1] by 0.04111
```

Άσκηση 3

Αλλάζοντας το init_probs βάζοντας 1 στην κατάσταση 3, Βλέπουμε το αποτέλεσμα είναι πολύ κοντά γιατί για να πάμε ξανά στην κατάσταση 1 πρέπει να περάσουμε από την 3 .So we estimate the Pr[X_(20) in 1|X_3 = 1] by 0.03869 . Υποψιαζόμαστε αν κι φαίνεται απο τον πίνακα μετάβασεις ότι η αλυσίδα είναι ανεξάρτητη της αρχικής κατανομής.

Άσκηση 4

Έχουμε υπολογίσει ότι η πιθανότητα είναι ίση με $a_n = \frac{2}{12} + \frac{10}{12} * (\frac{-1}{11})^n$ (μετατρέποντας το πρόβλημα σε ενα ισοδύναμο 2χ2 παιχνίδι κι υπολογίζοντας ιδιοτιμές κτλπ). Όποτε θα τρέξω για διαφορά n το πρόγραμμά να δω πόσο κοντά είναι τα αποτελέσματα.Γιαυτό το λόγο έφτιαξα ενα μικρό script, αλλά έβαλα λίγα steps γιατί κάθε επανάληψη του προγράμματος παίρνει αρκετή ώρα. Κι τα αποτελέσματα που έβγαλε είναι:

```
So we estimate the Pr[X_(2) in 1|X_1 = 1] by 0.17454
The Pr that we had calculated was 0.173554
So we estimate the Pr[X_(3) in 1|X_1 = 1] by 0.16433
The Pr that we had calculated was 0.166041
So we estimate the Pr[X_(4) in 1|X_1 = 1] by 0.16682
The Pr that we had calculated was 0.166724
So we estimate the Pr[X_(5) in 1|X_1 = 1] by 0.16596
The Pr that we had calculated was 0.166661
So we estimate the Pr[X_(6) in 1|X_1 = 1] by 0.16518
The Pr that we had calculated was 0.166667
So we estimate the Pr[X_(7) in 1|X_1 = 1] by 0.16842
The Pr that we had calculated was 0.166667
So we estimate the Pr[X_(8) in 1|X_1 = 1] by 0.16753
The Pr that we had calculated was 0.166667
So we estimate the Pr[X_(9) in 1|X_1 = 1] by 0.1649
The Pr that we had calculated was 0.166667
So we estimate the Pr[X_(10) in 1|X_1 = 1] by 0.16657
The Pr that we had calculated was 0.166667
So we estimate the Pr[X_(11) in 1|X_1 = 1] by 0.16598
The Pr that we had calculated was 0.166667
So we estimate the Pr[X_(12) in 1|X_1 = 1] by 0.16796
The Pr that we had calculated was 0.166667
So we estimate the Pr[X_(13) in 1|X_1 = 1] by 0.16639
The Pr that we had calculated was 0.166667
So we estimate the Pr[X_(14) in 1|X_1 = 1] by 0.16691
The Pr that we had calculated was 0.166667
So we estimate the Pr[X_(15) in 1|X_1 = 1] by 0.16581
The Pr that we had calculated was 0.166667
```

Script: ask32.sh prog: ex32.py

Άσκηση 5

Η πιθανότητα νίκη είναι ίση με 0.73762 . Το πρόγραμμα είναι το αρχείο ex4.py.