

Computational Physics

Topic 03 — Computational Problems involving Marko Chains

Lecture 02 — The Collector Problem

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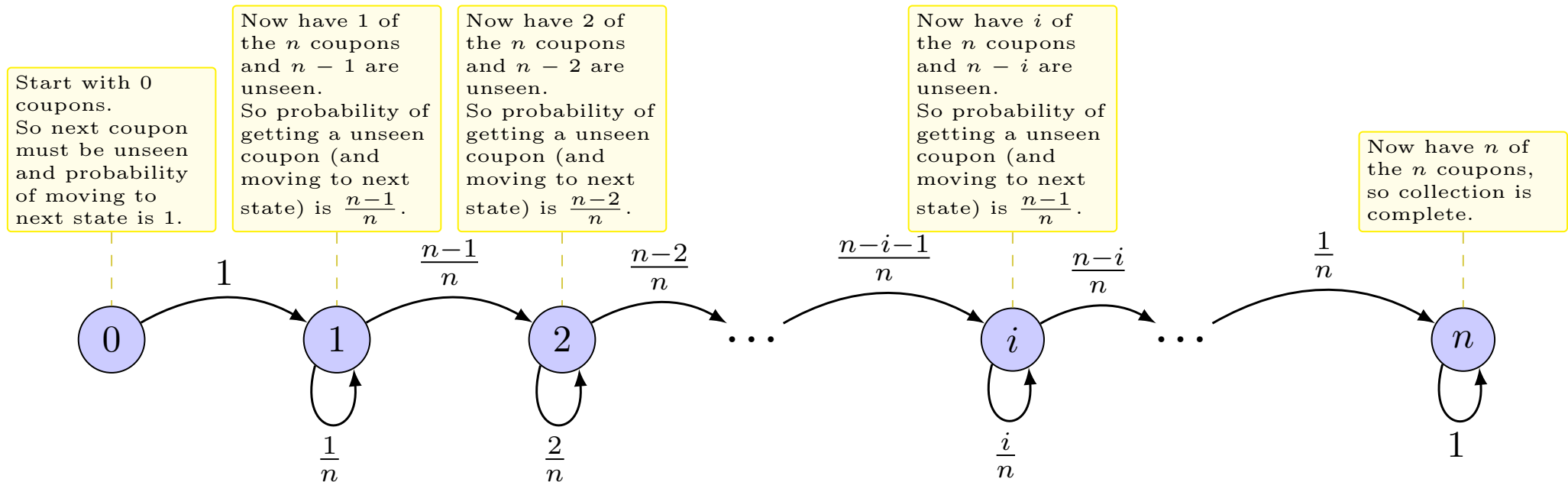
RESOURCE OUTLINE LABEL

- Problem statement
- Sample run

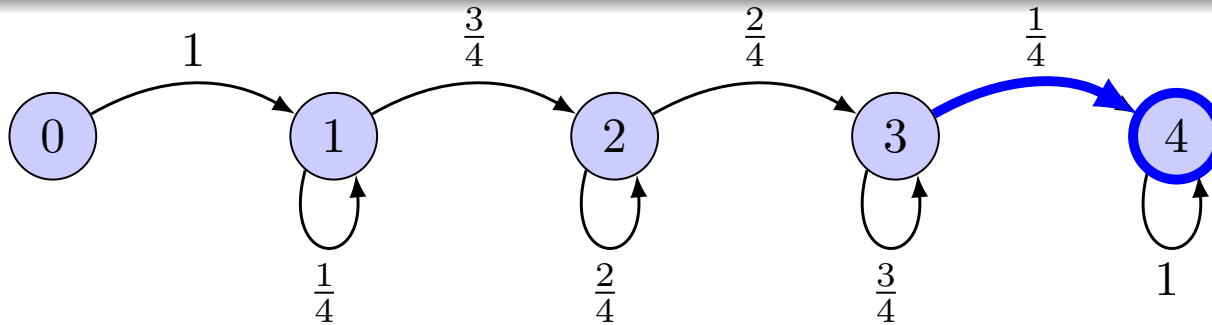
Markov chain approach

Model

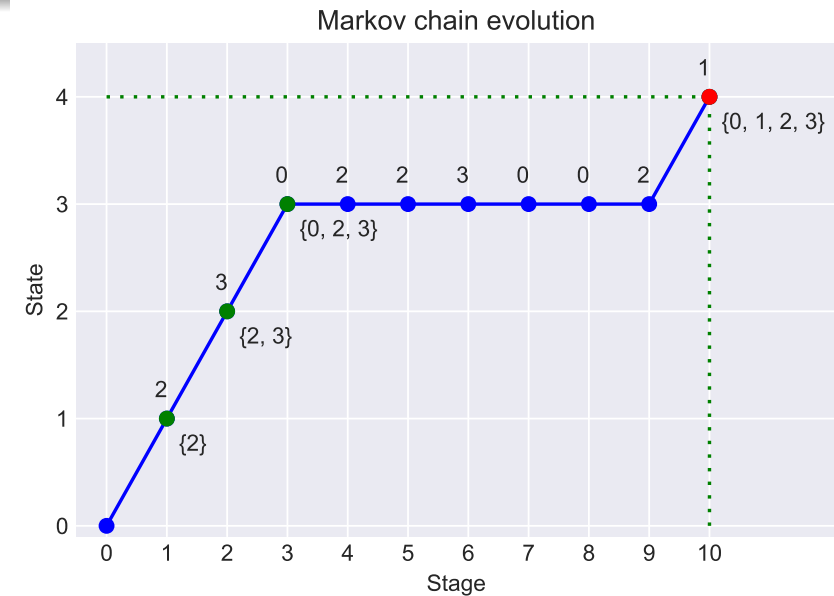
- **State:** $i, i = 0, \dots, n$, where i is number of collected coupons.
Have i of the n available coupons, so $(n - i)$ coupons are unseen.
- Initial state is 0. State n is terminal.
- **Stage:** Number of coupons purchased.
How long does it take to travel from 0 to n ?



Viewing our first simulation run as a Markov chain ...



count:	0	found:	collected:	set()
count:	1	found:	collected:	{2}
count:	2	found:	collected:	{2, 3}
count:	3	found:	collected:	{0, 2, 3}
count:	4	found:	collected:	{0, 2, 3}
count:	5	found:	collected:	{0, 2, 3}
count:	6	found:	collected:	{0, 2, 3}
count:	7	found:	collected:	{0, 2, 3}
count:	8	found:	collected:	{0, 2, 3}
count:	9	found:	collected:	{0, 2, 3}
count:	10	found:	collected:	{0, 1, 2, 3}



Number of stages needed = 10