

The Simple Harmonic Urn

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Abstract

We study a generalized Polya urn model with two types of ball. If the drawn ball is red it is replaced together with a black ball, but if the drawn ball is black it is replaced and a red ball is thrown out of the urn. When only black balls remain, the roles of the colours are swapped and the process restarts. We prove that the resulting Markov chain is transient but that if we throw out a ball every time the colours swap, the process is positive-recurrent.

Time permitting I will discuss the connections between the urn process and birth-death processes, a uniform renewal process and the Eulerian numbers.

This is joint work with Edward Crane, Stanislav Volkov, Andrew Wade and Robert Waters.