Erratum: Translated Poisson approximation for Markov chains

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Abstract: The paper is concerned with approximating the distribution of a sum W of integer valued random variables Y i , 1 i n, whose distributions depend on the state of an underlying Markov chain X. The approximation is in terms of a translated Poisson distribution, with mean and variance chosen to be close to those of W, and the error is measured with respect to the total variation norm. Error bounds comparable to those found for normal approximation with respect to the weaker Kolmogorov distance are established, provided that the distribution of the sum of the Y i 's between the successive visits of X to a reference state is aperiodic. Without this assumption, approximation in total variation cannot be expected to be good.

DOI: https://doi.org/10.1007/s10959-008-0190-6

J Theor Probab (2009) 22: 279–280
DOI 10.1007/s10959-008-0190-6

ERRATUM

Translated Poisson Approximation for Markov Chains

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Published online: 15 October 2008

Erratum to: J Theor Probab (2006) 19: 609–630 DOI 10.1007/s10959-006-0047-9

The geometrically small part of the error term in Lemma 4.1 was incorrectly treated in (4.7), and, as a result, the definition of the quantity b_i in the lemma needs to be altered to:

$$\begin{aligned} b_i := \tilde{\varphi}(n)\Big\{ & \tfrac{1}{2}\mathbb{E}\big\{|Y_i(A_i - A_i')|(|A_i| + |A_i'|)\big\} \\ & + \mathbb{E}\big\{|Y_i(A_i - A_i')|(H(T_i^+ - i) + H(i - T_i^-))\big\} \\ & + \mathbb{E}\big\{|Y_i(A_i - A_i')|\big\}\big\{\mathbb{E}|A_i| + \mathbb{E}(H(T_i^+ - i) + H(i - T_i^-))\big\}\Big\} \\ & + \gamma_i, \end{aligned}$$

where, for $1 \le i \le n/2$,

$$\gamma_i = 2\mathbb{E}\big\{|Y_i(A_i - A_i')|(I[T_i^+ - i > n/4] + \mathbb{P}[T_i^+ - i > n/4])\big\}, \quad 1 \le i \le n/2;$$
$$\gamma_i = 2\mathbb{E}\big\{|Y_i(A_i - A_i')|(I[i - T_i^- > n/4] + \mathbb{P}[i - T_i^- > n/4])\big\}, \quad n/2 < i \le n.$$

The online version of the original article can be found under doi:10.1007/s10959-006-0047-9.

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The quantity $\tilde{\varphi}(n)$ is smaller than the quantity $\varphi(n)$ appearing in the original statement of the lemma, and hence is still of the desired order $O(n^{-1/2})$ under assumption (3.7). The term γ_i is typically very much smaller.

Changing Lemma 4.1 leads to a minor change in the specification of the bound in Theorem 4.2, again without altering the main contribution. The remainder of the paper is unchanged. A corrected version, giving the proof of the new version of Lemma 4.1, is to be found at

arXiv:0810.0599v1 [math.PR]