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Over-correction for multilevel aggregation for Markov chains

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We present a simple automatic over-correction mechanism to accelerate multilevel aggregation methods for the computation of the stationary probability vector of irreducible Markov chains. Over-correction is motivated by the observation that while the coarse-grid correction typically approximates the error very well in the sense of its "direction", it may not provide a good approximation in the sense of its "size" [Vaněk and Míka, 1992]. In the case of a multiplicative correction scheme, which is commonly used for Markov chains, we apply the over-correction technique via componentwise exponentiation of the correction by a small factor $\alpha > 1$, that is recalculated on each level. Numerical experiments demonstrate that this approach can lead to significant speedup of basic multilevel aggregation for Markov chains, at little extra cost.