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Algebraic Multigrid for Markov Chains

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An algebraic multigrid (AMG) method is presented for the calculation of the stationary probability vector of an irreducible Markov chain. We propose a modified AMG interpolation formula, which produces a nonnegative interpolation operator with unit row sums. It is shown how the adoption of a lumping technique maintains the irreducible singular M-matrix character of the coarse-level operators on all levels. Together, these properties are sufficient to establish the well-posedness of our algorithm. Numerical results show how our method leads to nearly optimal multigrid efficiency for a representative set of test problems.