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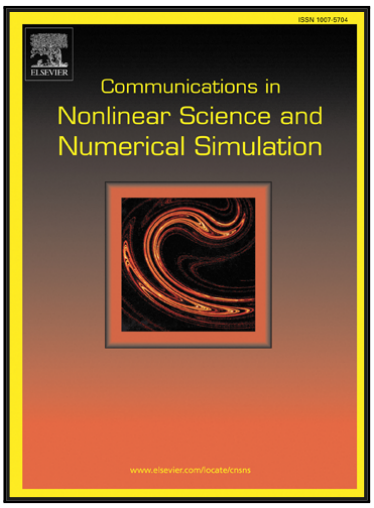

Block-accelerated aggregation multigrid for Markov chains with application to PageRank problems

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Highlights

- Aggregates on each level are also utilized to transfer the probability equation of that level into a block linear system that would be nearly block diagonally dominant.
- A Block-Jacobi relaxation is constructed based on the block linear system on each level for smoothing error more efficiently than the point-wise Jacobi relaxation.
- On each level, this Block-Jacobi relaxation is implementable, and it can maintain the positivity of approximate solutions and can converge to a nontrivial solution of the probability equation.
- An adaptive strategy enables this relaxation algorithm to avoid operations with dense matrices when solving PageRank problems.
- Various numerical experiments illustrate the effectiveness of this technique on accelerating the adaptive algebraic aggregation multigrid method and its variants for solving Markov chain problems, especially PageRank problems.

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