

**Approximate Inverse Preconditioning
for singular Systems
with Applications to Markov Chains**

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Here we consider different explicit preconditioners for the iterative solution of large linear systems of equation. Explicit preconditioners approximate the inverse of the system matrix. Well-known explicit preconditioners are the SPAI algorithm by Grote and Huckle, the AINV algorithm by Benzi and Tuma and the FSPAI algorithm by Kolotilina and Yeremin. If one wants to apply these algorithms to singular systems two major questions arise. First, do one needs any modification for the singular case? Second, which matrix is approximated? Here we answer these questions in detail for the FSPAI algorithm applied to M-matrices. We show which modifications are needed and we prove that this algorithm approximate a $(1,2)$ inverse.

Finally we apply the FSPAI algorithm to the numerical solution of Markov Chains.