SOR-like methods for solving the Sylvester equation

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We present new iterative methods for solving large-scale Sylvester equation \((AX -XB = C)\). The proposed algorithms belong to the class of SOR-like methods, based on the SOR (Successive Over-Relaxation) method for solving linear systems (the first of the methods was proposed by Z. Woźnicki). All three are stationary iterative methods for solving \(AX -XB = C\). We discuss convergence characteristics of the methods and present sufficient conditions under which proposed method ISOR-like is convergent.

We also present an idea of changing the given matrices \(A\) and \(B\) such that \(C\) and solution \(X\) remain the same, but the convergence of any SOR-like method is improved.

Some numerical experiments are given to illustrate the theoretical results and some properties of the methods.

References
