# NEW CONDITIONS FOR NON-STAGNATION OF GMRES, AND CORRESPONDING CONVERGENCE BOUNDS

**Daniel B. Szyld**
*Temple University, Philadelphia, USA*
*e-mail:* szyld@temple.edu

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**Abstract**

A well-established condition guaranteeing that GMRES makes some progress, i.e., that it does not stagnate, is that the symmetric part of the coefficient matrix, $(A+A^T)/2$, be positive definite [1]. This condition results in a bound of the convergence rate for the iterative method which depends on the minimum eigenvalue of $(A + A^T)/2$ and of the norm of $A$. This bound is usually very pessimistic. Nevertheless, it has been extensively used, e.g., to show that certain preconditioned problems have a convergence bound for GMRES which is independent of the underlying mesh size of the discretized partial differential equation. In this talk we discuss new and more general conditions on the coefficient matrix so that one can guarantee that there is no stagnation of GMRES. These conditions do not require the symmetric part of the coefficient matrix to be positive definite. Thus, we enlarge the class of matrices for which a bound of the convergence rate for GMRES is available.

(joint work with Valeria Simonicini, Universitá di Bologna)

## References

[1] Howard H. Elman, *Iterative methods for large sparse nonsymmetric systems of linear equations*, Ph.D. Thesis, Yale University, New Haven, CT, 1982.