On the limiting accuracy of segregated saddle point solvers

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Abstract

Saddle point problems arise in a wide variety of applications in computational science and engineering. The aim of this paper is to discuss numerical behavior of several iterative methods applied for solving the saddle point systems via the Schur complement reduction or the null-space projection approach. Krylov subspace methods often produce the iterates which fluctuate rather strongly. Here we address the question whether large intermediate approximate solutions reduce the final accuracy of these two-level (inner-outer) iteration algorithms. We distinguish between three mathematically equivalent back-substitution schemes which lead to a different numerical behavior when applied in finite precision arithmetic. Theoretical results are then illustrated on a model example.

Keywords

Saddle point problems, Schur complement reduction method, Null-space projection method, Rounding error analysis.

References:

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