

A UNIFIED APPROACH FOR UZAWA ALGORITHMS

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ABSTRACT. We present a unified approach in analyzing Uzawa iterative algorithms for saddle point problems. We study the classical Uzawa method, the augmented Lagrangian method, and two versions of inexact Uzawa algorithms. The target application is the Stokes system, but other saddle point systems, e.g., arising from mortar methods or Lagrange multipliers methods, can benefit from our study. We prove convergence of Uzawa algorithms and find optimal rates of convergence in an abstract setting on finite or infinite dimensional Hilbert spaces. The results can be used to design multilevel or adaptive algorithms for solving saddle point problems. The discrete spaces do not have to satisfy the stability (LBB) condition.

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