

On Convergence Rate of the Augmented Lagrangian Algorithm for Nonsymmetric Saddle Point Problems

by Gerard Awanou

joint work with Ming-Jun Lai

Abstract

We are interested in solving the system

$$\begin{pmatrix} A & L^T \\ L & 0 \end{pmatrix} \begin{pmatrix} c \\ \lambda \end{pmatrix} = \begin{bmatrix} F \\ G \end{bmatrix} \quad (1)$$

by a variant of the augmented lagrangian algorithm. This type of problem typically arises in certain discretizations of the Navier-Stokes equations. Here A is a (n, n) matrix, $c, F \in \mathbb{R}^n$, L is a (m, n) matrix, and $\lambda, G \in \mathbb{R}^m$. We assume that A is invertible on the kernel of L . Convergence rates of the augmented lagrangian algorithm are known in the symmetric case but the proofs in [Glowinski and LeTallec'89] used spectral arguments and cannot be extended to the nonsymmetric case. The purpose of this paper is to give a rate of convergence of a variant of the algorithm in the nonsymmetric case.

References

- [1] R. Glowinski, P. LeTallec, *Augmented Lagrangian and operator splitting methods in nonlinear mechanics*, Society for Industrial and Applied Mathematics (SIAM), 1989.