

A Stabilized Multigrid Solver for Hyperelastic Image Registration

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Image registration is a central problem in a variety of areas involving imaging techniques, and is known to be challenging and ill-posed. Regularization functionals based on hyperelasticity provide a powerful mechanism for limiting the ill-posedness. A key feature of hyperelastic image registration approaches is their ability to model large deformations while guaranteeing their invertibility. In this talk we focus on computational challenges arising in approximately solving the Hessian system. We show that the Hessian is a discretization of a strongly coupled system of partial differential equations whose coefficients can be severely inhomogeneous. Motivated by a local Fourier analysis, we stabilize the system by thresholding the coefficients.

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