Joseph Benzaken

Multigrid Methods for Isogeometric Thin Plate Discretizations

2805 Olson Dr Unit B
Boulder
CO 80303
`Joseph.Benzaken@colorado.edu`
Joseph Benzaken
Christopher Coley
John A. Evans

In this talk, we present a novel isogeometric approach to the numerical solution of the classical Reissner-Mindlin and Kirchhoff-Love plate equations. This approach eliminates the common issue of locking in thin plates, a numerical phenomenon resulting from an incompatibility between the finite element spaces for the translational and rotational displacement degrees of freedom. This locking-free implementation also permits the use of a simple geometric multigrid method for solving the resulting linear system in which Schwarz methods with intelligently-chosen subdomains are used for iterative smoothing in the multigrid V-cycles. In the thin plate limit, our multigrid approach automatically and exactly preserves the constraint that the shear strain is zero at every geometric level. This results in a method with convergence rates independent of the thickness. Moreover, this elucidates the problem as a network of coupled plates with Dirichlet boundary data specified by adjacent subdomains. Numerical results for both the Kirchhoff-Love and Reissner-Mindlin plates are presented. The results demonstrate the robustness of the numerical method through the invariance of convergence rates with respect to thickness.