C. Carstensen (Humboldt-Unoversität zu Berlin) on

Eigenvalue Computation for Symmetric PDEs

Recent advances in the nonconforming FEM approximation of elliptic PDE eigenvalue problems include the guaranteed lower eigenvalue bounds (GLB) and its adaptive finite element computation. Like guaranteed upper eigenvalue bounds with conforming finite element methods, GLB arise naturally from the min-max principle, also named after Courant, Fischer, Weyl in the finite-dimensional case.

The first part introduces the derivation of GLB for the simplest second-order and fourth-order eigenvalue problems with relevant applications for the localization of in the critical load in the buckling analysis of the Kirchhoff plates.
The second part studies an optimal adaptive mesh-refining algorithm for the effective eigenvalue computation for the Laplace operator with optimal convergence rates in terms of the number of degrees of freedom relative to the concept of nonlinear approximation classes.
The third part introduces a modified scheme with fine-tuned extra stabilization that allows for adaptive simulations with optimal convergence rates.

The topics reflect earlier joint work with Joscha Gedicke (Bonn) and Dietmar Gallistl (Jena) and recent joint work with Sophie Puttkammer (Berlin).

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