Talk announcement

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A decomposition result for Kirchhoff plate bending problems and associated discretization approaches

In this talk, we introduce a new mixed variational formulation for a Kirchhoff plate bending problem. The plate is considered to be clamped, simply supported and free on different parts of the boundary.

The new mixed formulation uses for the deflection the standard Sobolev space H^1 (with appropriate boundary conditions), but involves a nonstandard Sobolev space for the auxiliary variable, the bending moments, which are related to the Hessian of the deflection. The new formulation satisfies Brezzi's conditions and is equivalent to the original problem. Based on a regular decomposition of this nonstandard Sobolev space, a decomposition of the fourth-order problem into three (consecutively to solve) second-order elliptic problems in standard Sobolev spaces is achieved.

Based on this decomposition result, we can derive in a natural way families of finite elements for triangular and quadrilateral meshes and also isogeometric discretizations. Note, this method is only based on standard components for second-order problems regarding both the discretization and the solver of the discrete problem. Moreover, we present numerical experiments, which are in accordance with our theoretical findings.