FEM for problems with piezoelectric material

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Piezoelectricity describes the coupling of deformation and electric field in special materials. The talk introduces a numerical approach to simulate piezoelectric material behaviour by using Finite Elements. We use the method of adaptive mixed FEM for handling the resulting coupled differential equations.

We give an introduction to the linear model, followed by a briefly description of the used solver (Bramble–Pasciak–CG) with preconditioner and ideas for error estimation needed by the refinement strategy. First computational results using an experimental program will be shown. Beside simple test examples, we investigate a special problem including a crack in some details. Known analytical solutions in special cases allow a partial validation of the FEM program. Finally, we discuss occuring numerical instabilities.

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