FINITE ELEMENT EXTERIOR CALCULUS AND DISCRETIZATIONS OF THE ELASTICITY COMPLEX

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Finite element exterior calculus is an approach to the design of stable finite element discretizations for a wide variety of systems of partial differential equations. Stability is achieved by developing discretizations which are compatible with the geometric and algebraic structures, such as de Rham cohomology and Hodge decompositions, which underlie well–posedness of the system of partial differential equations being solved. Instead of considering the design of discrete approximations for each particular problem separately, it has proved beneficial to simultaneously study approximations of an entire differential complex.

In this talk we will give an overview of finite element exterior calculus. In particular, we will discuss discrete versions of the elasticity complex in three space dimensions. The elasticity complex has proved to be important for the construction of mixed finite element methods for linear elasticity, derived from the Hellinger–Reissner principle. Furthermore, this complex indicates a connection between mixed finite element methods for elasticity and discretizations of the Einstein curvature tensor appearing in general relativity.

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