

Towards a Variational Complex for the Finite Element Method

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Abstract

Differential complexes are being seen as an important theoretical tool in the analysis of finite element methods, particularly for problems with a strong geometric content. The most well-known complex is the de Rham complex for differential forms, and complexes for finite element schemes are projections of it.

The variational complex is an extension of the de Rham complex which allows one to study Euler Lagrange equations, their symmetries and conservation laws, in a rigorous way. The question we ask in this talk is whether one can develop an analogous variational complex for finite difference schemes. Such a development should take into account how variational methods are used in common finite element approximations, but also allow a rigorous framework for conservation laws, their inheritance by a scheme, and the detection of spurious or unwanted conserved quantities.

Joint work with Reinout Quispel.