TITLE:

Adaptivity in High-Order Numerical Methods for PDEs

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ABSTRACT:

Over the last few years, a collaboration with R.H. Nochetto (Maryland), R. Stevenson (Amsterdam) and M. Verani (Milano) has been focussed on the design and analysis of adaptive spectral or *hp*-type finite element discretization methods for elliptic equations.

Such classes of methods pose several interesting challenges: the choice between applying a mesh refinement or a polynomial enrichment is a delicate stage in the adaptive process, and the optimality of the approximation should be assessed with respect to specific functional classes in which the best approximation error is allowed to decay exponentially.

We will discuss *hp-AFEM*, an adaptive finite element algorithm of *hp*-type: it is based on alternating a solution stage, which provides a new approximate solution with guaranteed error reduction, and an adaptation stage, which yields a new *hp*-nearbest partition at the expense of a mild increase of the error. Under reasonable assumptions, this general algorithm is proven to be convergent with geometric rate, and instance optimal. Several practical realizations of *hp-AFEM* will be considered.