Space and time reconstructions in a posteriori error control of evolution problems

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We review some recent results on a posteriori error analysis of evolution equations based on appropriate reconstruction operators. These operators are used to derive reformulations of the discretization methods as perturbed evolution pdes with source terms of a posteriori type. As result energy or other standard techniques yield optimal a posteriori error estimates not known before. Using the “Elliptic Reconstruction” this approach applies to space discrete and fully discrete parabolic problems. When higher order in time discretization methods are used appropriate “time reconstructions” are introduced. Thus optimal a posteriori error estimates for time discretizations by the discontinuous Galerkin method, the Crank-Nicolson method, Runge-Kutta-Collocation methods of arbitrary order for linear and nonlinear evolution problems are derived. This is a rather general approach which can be applied to linear as well as to nonlinear problems with dissipative or hyperbolic character.

References


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