A Posteriori Error Estimate for Finite Elements Approximation of Parabolic Equations

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Adaptive discretization methods are very important tools for obtaining numerical solutions of partial differential equations modelling technical, physical and social phenomena. Those methods rely heavily on a posteriori error estimates in order to acquire global and local information on the error, depending only on the numerical solution and the data of the PDE, and assure optimality of the respective algorithms.
The goal of this talk is to present some aspects of numerical simulations of an anisotropic, non-homogeneous advection-diffusion equation, namely the error estimates proposed by Rüdiger Verfürth in [1]. A classical conforming finite element method is used for the spatial and temporal discretization of a model problem from which residual error estimators follow. We focus on the main difficulties behind using such techniques in the derivation of local error estimates and problems caused by the lack of symmetry of the differential operator.
Finally, we allude to the significance of the a posteriori residual error estimates in numerical algorithms, concerning optimality and precision.

References

[1] R. Verfürth, *A Posteriori Error Estimation Techniques for Finite Element Methods*, Oxford University Press, 2013