Elitenetzwerk Bayern

UNIVERSITÄT BAYREUTH

Lecture Series as part of the elite degree programme Scientific Computing

Date: 19.12.2019 | Time: 4:30 pm | Location: H19, Building NW II

Coffee/tea from 4:00 pm in the seminar room 748, NW II

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Goal-Oriented Error Estimation for Nonlinear Parabolic Problems

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Abstract: In this talk, we present goal-oriented a posteriori error estimators for the error due to time-discretization of nonlinear parabolic partial differential equations. At first, we consider the introductory case of a (Petrov-)Galerkin time discretization and derive a dual weighted residual (DWR) estimator for this case.

In the second part of the talk, we extend the derived results to a time discretization by a general theta time-stepping method that unifies simple schemes like forward and backward Euler as well as the Crank-Nicolson method. This extension will be done by a formulation as Petrov-Galerkin discretization that is up to a numerical quadrature error equivalent to the theta time-stepping scheme. The error estimator then consists of one weighted residual term given by the DWR method and one additional residual estimating the Galerkin error between time-stepping scheme and Petrov-Galerkin formulation.

We conclude by demonstrating the capabilities of the developed concepts by means of numerical examples.