Vortragsankündigung

Im Rahmen unseres gemeinsamen Oberseminars

Numerische Mathematik, Optimierung und Dynamische Systeme

spricht

Herr Dipl. Math. Michael Geiger
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Lehrstuhl Numerische Mathematik (Prof. Dr. Dr.h.c. Rolf Rannacher)

am Montag, 28. Oktober 2013, 16 Uhr c. t. über das Thema

„Adaptive approaches in the context of multiple shooting methods"

Abstract:

Multiple shooting methods are a state-of-the-art tool for the solution of ODE boundary value and optimal control problems, but they are not yet established as a standard solver for parabolic PDE problems with inherent instabilities and to PDE constrained optimal control problems (see, however, Carraro et al. [1]). As the computational costs for the solution of PDE problems are usually considerably larger than those arising from ODE problems (which is mainly due to the necessary additional discretization of the spatial variables), in the PDE context the application of adaptive techniques is often indispensable. This talk addresses two main aspects of adaptive computation that are attractive in the multiple shooting framework.

On the one hand, numerical examples suggest the importance of determining an optimal number and distribution of shooting intervals. First steps toward solving this problem for ODE boundary value problems were done by Mattheij and Staarink [2]. However, the method they proposed is based on heuristic assumptions and does not work for nonlinear problems. We extend the approach to nonlinear ODE problems and discuss the difficulties arising in the PDE framework (see Carraro and Geiger [3]).

On the other hand, the past decade has shown the advantages of a posteriori error estimation techniques combined with goal-oriented mesh adaptation for a broad variety of problems. The dual weighted residual (DWR) approach (for a survey see, e.g., Becker and Rannacher [4]) is especially suited for PDE optimal control problems. As recent results by Meidner et al. [5] and Rannacher and Vihharev [6] have shown, this method also yields efficient stopping criteria for linear and nonlinear iterative processes employed as subroutines in the overall solution algorithm for PDE problems. Up to now the only result concerning a combination of multiple shooting methods for PDE governed optimal control and DWR based adaptive techniques is Hesse and Kanschat [7]. However, their approach has
a certain margin for improvement. We suggest a modification which also comprises a first step toward controlling the number of Newton iterations for the shooting system in the spirit of [6]. This talk sketches several adaptive techniques and substantiates some of the methods by numerical examples.


Der Vortrag findet im S 80, Gebäude NW II statt.

gez. Hans-Josef Pesch