JOHANNES KEPLER UNIVERSITY LINZ

Johannes Kepler Universität Linz
Institut für Numerische Mathematik

o.Univ.-Prof. Dr. Ulrich Langer

Talk announcement

Bernhard Endtmayer, BSc

Tuesday, March 21, 2017
15:30, S2 059

Adaptive Mesh Refinement for Multiple Goal Functionals

In practical applications, one is often not interested in the entire solution of a partial differential equation, but in a special quantity of interest, which depends on the solution. Since in general, we cannot find the solution of the partial differential equation exactly and we have to construct a numerical approximation. This leads to an inaccuracy in the quantity of interest as well. Now one could think about just trying to increase the accuracy in our quantity of interest and not in the entire solution. This can be achieved by applying adaptive mesh refinement with respect to the quantity of interest. One possibility of such a technique is the dual weighted residual method based on an error estimator with a variational localization via a partition of unity. Therein, local cell residuals are weighted by a localized adjoint solution. However, there can be more than one quantity of interest. In this thesis, we will discuss how the dual weighted residual method can be applied to several goal functionals at once. We will investigate algorithmic techniques to formulate and solve such a multiple goal functionals problem. A naive approach would be solve to each goal functional one adjoint problem, which is computationally costly. Rather, we adopt a dual-dual problem, which yields an adjoint state by just two additional solves. The key result of this thesis is a new procedure to solve the dual-dual problem. In the numerical examples, we show how the different quantities of interest affect each other, and in which situations our new method leads to an improvement in comparison with global refinement.