Visiting lecture

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Estimation of modelling and approximation errors arising in PDE-based numerical methods

Wednesday 7.10.2015 at 14.15-15.00 in the lecture hall K3114
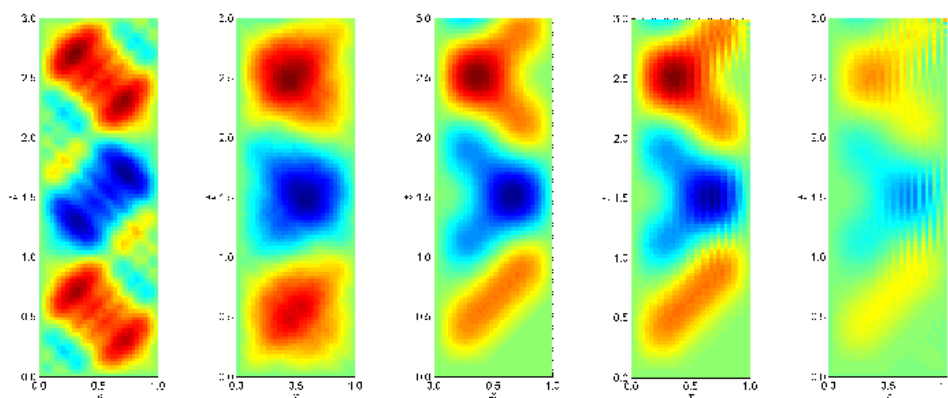
Abstract

This talk concerns estimation of different errors arising in numerical simulations based on mathematical models generated by "standard" partial differential equations. Basic numerical solution methods are briefly recalled and the nature of a priori and a posteriori error estimates is discussed. Main emphasis is on the so called funtional type a posteriori error estimates developed by S. Repin in late 90's. These estimates possess important properties, which allow to extend their use to estimate and control the errors resulting, e.g., from uncertain parameters and simplifying modelling assumptions. Finally, proper error measures motivated by classical convex analysis in certain nonlinear problems (variational inequalities of the first kind and the second kind) are discussed and their use is demonstrated on a paradigm of a reaction diffusion problem with a power growth reaction term.

References:
P. Neittaanmäki and S. Repin. Reliable methods for computer simulation, Error control and a posteriori estimates. Elsevier, New York, 2004.
S. Repin. A posteriori estimates for partial differential equations, volume 4 of Radon Series on Computational and Applied Mathematics. Walter de Gruyter GmbH & Co. KG, Berlin, 2008.
O. Mali, P. Neittaanmäki, and, S. Repin. Accuracy verification methods: Theory and algorithms, Computational methods in applied sciences, Vol. 32, Springer, 2014.

25.9.2015 Reijo Kouhia