Mathematics Colloquium at IUB

Stephan Dahlke

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will speak on

Adaptive Wavelet Schemes for Elliptic Operator Equations: Theoretical Analysis and Practical Realization

Date:	**Monday, December 4, 2006**
Time:	**17:15**
Place:	**Lecture Hall Research II, IUB**

Abstract:

The aim of this talk is to give an overview on recent developments concerning the numerical treatment of (elliptic) operator equations by means of adaptive wavelet methods. The first part of the presentation is devoted to the theoretical analysis of adaptive schemes. We intend to give a rigorous answer to the fundamental question: when does adaptivity pay? It turns out that the efficiency of an adaptive scheme is determined by the regularity of the exact solution of the operator equation in the specific scale $B_\tau^\alpha(L_\tau(\Omega))$, $\tau := (\alpha/d + 1/p)^{-1}$ of Besov spaces. Thus, at least for some simple model problems, the regularity of the solution in this scale is investigated with the aim of determining the largest α for which the solution is in $B_\tau^\alpha(L_\tau(\Omega))$. It turns out that the Besov regularity is high enough to justify the use of adaptive schemes.

In the second part of the talk, we shall discuss some recent developments concerning the practical realization of adaptive wavelet schemes. Using the equivalence of Sobolev norms with weighted sequence norms of wavelet expansions, it is possible to derive reliable and efficient a posteriori error estimators. Moreover, based on these error estimators it is possible to derive an adaptive refinement strategy which is guaranteed to converge for a large class of problems including operators of negative order. We also discuss generalizations to discretization schemes based on (wavelet) frames.

We finish this talk with some numerical experiments for the Poisson equation.

Colloquium Tea at ca. 16:45 in the Tea Room of Research II, close to the lecture hall. Everybody is welcome!

M. Stoll