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Abstracts of Plenary and Invited Lectures

Section:

15. Numerical Analysis and Scientific Computing

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Jan-Olov Strömberg, Royal Institute of Technology, Stockholm, Sweden

Apriori estimates for approximation by wavelets in higher dimensions.

In dimension d, a lattice grid of size N has N^d points. The representation of a function by, for instance, splines or the so-called non-standard wavelets with error ϵ would require $O(\epsilon^{-ad})$ lattice point values (resp. wavelet coefficients), for some positive a depending on the spline order (resp. the properties of the wavelet). Unless d is very small, we easily will get a data set that is larger than a computer in practice can handle, even for very moderate choices of N or ϵ.
I will discuss how to organize the wavelets so that functions can be represented with $O((\log(1/\epsilon))^{a(d-1)}\epsilon^{-a})$ coefficients. Using wavelet packets, the number of coefficients may be further reduced.
In the talk, I will only give some basic ideas and basic estimates. To work out these ideas in real applications is a longer project, which I have only begun. Some ideas with details can be found in the Cand. Scient. thesis of my student Øyvind Bjørkås. Also, further work on this theme is planned to be included in his Ph. D. thesis.

Reference: Ø. Bjørkås, Numerical Analysis of Singular Integral Operators with wavelets, Cand. Scient. thesis, University of Tromsø, 1997.