

Sonderforschungsbereich 611

Singuläre Phänomene und Skalierung in
mathematischen Modellen

Einladung zu einem Vortrag im SFB-Seminar

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spricht zum Thema

Multiscale approximation on the sphere

Zeit: Dienstag, den 1. Dezember 2009, 17.00 Uhr

Ort: Kleiner Hörsaal, Wegelerstr. 10

Kaffee/Tee: 16.30 Uhr

gez. Michael Griebel

Abstract: This talk describes recent joint work with Q. Thong Le Gia and Holger Wendland, in which we describe, analyse and illustrate a multiscale method for the unit sphere $\mathbb{S}^2 \subset \mathbb{R}^3$. The multiscale approximation is constructed using scaled versions of a single compactly supported radial basis function (RBF) $\Psi(\mathbf{x}, \mathbf{y}) = \psi(|\mathbf{x} - \mathbf{y}|)$ for $\mathbf{x}, \mathbf{y} \in \mathbb{R}^3$. It uses a sequence of decreasing scales $\delta_1, \delta_2, \dots$, and a sequence of point sets X_1, X_2, \dots , with the mesh norm of X_j proportional to δ_j . The approximation is a linear combination of scaled RBFs $\Psi_\delta(\mathbf{x}, \mathbf{y}) := c_\delta \Psi(\frac{|\mathbf{x} - \mathbf{y}|}{\delta})$ with different scales δ , restricted to the sphere \mathbb{S}^2 . The j th term is the correction at stage j obtained by interpolating the error at stage $j - 1$ using RBFs for the finer scale δ_j and the larger point set X_j . While the idea of a multiscale scheme has appeared previously, for example in papers of Schaback, Narcowich/Schaback/Ward, Floater/Iske, and Hales/Levesley and books and papers of Freeden and colleagues, there seems to be no existing analysis of a multiscale approximation based on scaled versions of a single compactly supported RBF and scattered data, for either spherical or Euclidean regions. In this talk I shall outline the ideas behind our error analysis for the sphere, and illustrate the method with a problem from geophysics, that of approximating height above sea level on Earth.