Regularity of boundary integral equations in Besov-type spaces based on wavelet expansions

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We study regularity properties of solutions to operator equations on patchwise smooth manifolds $\partial\Omega$ such as, e.g., boundaries of polyhedral domains $\Omega \subset \mathbb{R}^3$. Using suitable biorthogonal wavelet bases Ψ, we introduce a new class of Besov-type spaces $B^\alpha_{\Psi,q}(L_p(\partial\Omega))$ of functions $u\colon \partial\Omega \to \mathbb{C}$. Special attention is paid on the rate of convergence for best n-term wavelet approximation to functions in these scales since this determines the performance of adaptive numerical schemes. We show embeddings of (weighted) Sobolev spaces on $\partial\Omega$ into $B^\alpha_{\Psi,\tau}(L_\tau(\partial\Omega))$, $1/\tau = \alpha/2 + 1/2$, which lead us to regularity assertions for the equations under consideration. Finally, we apply our results to a boundary integral equation of the second kind which arises from the double layer ansatz for Dirichlet problems for Laplace's equation in Ω.
The talk is based on two recent papers which arose from the DFG-Project "BIOTOP: Adaptive Wavelet and Frame Techniques for Acoustic BEM" (DA 360/19-1):

Dahlke, S. and Weimar, M.: Besov regularity for operator equations on patchwise smooth manifolds. Preprint 2013-03, Fachbereich Mathematik und Informatik, Philipps-Universität Marburg. To appear in J. Found. Comput. Math.
Weimar, M.: Almost diagonal matrices and Besov-type spaces based on wavelet expansions. Preprint 2014-06, Fachbereich Mathematik und Informatik, Philipps-Universität Marburg. Submitted.

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