The $\mathcal{H}^2$-wavelet method

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We introduce the $\mathcal{H}^2$-wavelet method for the fast solution of nonlocal operator equations on unstructured meshes. On the given mesh, we construct a wavelet basis which provides vanishing moments with respect to the traces of polynomials in the space. With this basis at hand, the system matrix in wavelet coordinates is compressed to $\mathcal{O}(N \log N)$ relevant matrix coefficients, where N denotes the number of boundary elements. The compressed system matrix is computed with nearly linear complexity by using the $\mathcal{H}^2$-matrix approach. Numerical results in three spatial dimensions validate that we succeeded in developing a fast wavelet Galerkin scheme on unstructured triangular or quadrangular meshes.