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Representation of multidimensional potentials by approximate wavelets

There exist a large class of functions which can be used to derive accurate semi–analytic cubature formulas for multivariate integral operators. These functions are smooth, decay rapidly and have the property that the application of the integral operator to them can be determined analytically. But no linear combinations of these functions reproduce polynomials, such that approximations do not converge, in general. However, one can control the basic functions such that for any prescribed accuracy there exist simple approximants providing high order approximation rates up to this accuracy. We perform an approximate multiresolution analysis which is exact within a prescribed accuracy. This allows the application of wavelet based methods for sparse approximation of volume potentials.