A Multiresolution Wavelet Representation in Two or More Dimensions

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In the multiresolution approximation, a signal is examined on a hierarchy of resolution scales by projection onto sets of smoothing functions. Wavelets are used to carry the detail information connecting adjacent sets in the resolution hierarchy. An algorithm has been implemented to perform a multiresolution decomposition in $n \geq 2$ dimensions based on wavelets generated from products of 1-D wavelets and smoothing functions. The functions are chosen so that an n-D wavelet may be associated with a single resolution scale and orientation. This algorithm enables complete reconstruction of a high resolution signal from decomposition coefficients. The signal may be oversampled to accommodate non-orthogonal wavelet systems, or to provide approximate translational invariance in the decomposition arrays.