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Multidimensional Prolate Spheroidal Wavelets.

Prolate spheroidal wavelets (PS wavelets) based on the first prolate spheroidal wave function (PSWF), have recently been shown to have many desirable properties lacking in other wavelets. They were based on a solution to a maximization problem and were the principal eigenfunctions of an integral operator. We now introduce prolate spheroidal wavelets in higher dimensions as a solution to a similar maximization problem. They are again based on an eigenfunction of an integral operator, but in contrast to one dimension, do not in general satisfy a differential equation. Nonetheless, they can be constructed by means of a discrete operator. These PS wavelets have an associated pair of sets in the Fourier and space domain. For particular choices of these sets, we obtain a multidimensional wavelet system with similar desirable properties. (Received September 07, 2005)