Meeting: 999, Nashville, Tennessee, SS 2A, Special Session on Wavelets, Frames, and Sampling

999-42-69 **Bin Han*** (bhan@math.ualberta.ca), Dept. of Mathematical & Statistical Sciences, University of Alberta, Edmonton, Alberta T6G 2G1, Canada. *Multidimensional Riesz Wavelets Derived from Refinable Function Vectors.* Preliminary report.

Let ϕ be a compactly supported refinable function vector with multiplicity r in the space $L_2(\mathbb{R}^s)$. Let $\widehat{b^\ell}, \ell = 1, \ldots, 2^s - 1$ be $r \times r$ matrices of 2π-periodic trigonometric polynomials and define wavelet vectors ψ^ℓ by $\widehat{\psi^\ell}(2\xi) = \widehat{b^\ell}(\xi)\hat{\phi}(\xi)$. We establish a necessary and sufficient condition for $\{\psi^\ell : \ell = 1, \ldots, 2^s - 1\}$ generating a Riesz wavelet basis in $L_2(\mathbb{R}^s)$. We shall also propose a numerical algorithm to check whether $\{\psi^\ell : \ell = 1, \ldots, 2^s - 1\}$ generates a Riesz wavelet basis in $L_2(\mathbb{R}^s)$ or not. As a result, we show that the Loop wavelet system, which has been successfully used by Khodakovsky, Schröder and Sweldens in mesh compression in computer graphics, is indeed a Riesz wavelet basis of $L_2(\mathbb{R}^2)$. We shall also present some examples of Riesz multiwavelet bases in $L_2(\mathbb{R})$ and $L_2(\mathbb{R}^2)$. Since the generators of such Riesz multiwavelet bases have very short support and are functions of piecewise polynomials with symmetry, such Riesz wavelet bases are of interest in wavelet-based numerical algorithms. This is joint work with Rong-Qing Jia and Zuowei Shen. (Received August 06, 2004)