

Biorthogonal Wavelets on the Spectrum

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Abstract

In this article, we introduce the notion of biorthogonal nonuniform multiresolution analysis on the spectrum $\Lambda = \left\{0, \frac{r}{N}\right\} + 2\mathbb{Z}$, where $N \geq 1$ is an integer and r is an odd integer with $1 \leq r \leq 2N-1$ such that r and N are relatively prime. We first establish the necessary and sufficient conditions for the translates of a single function to form the Riesz bases for their closed linear span. We provide the complete characterization for the biorthogonality of the translates of scaling functions of two nonuniform multiresolution analysis and the associated biorthogonal wavelet families. Furthermore, under the mild assumptions on the scaling functions and the corresponding wavelets associated with nonuniform multiresolution analysis, we show that the wavelets can generate Riesz bases.

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