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Convergence of the cascade algorithm at irregular scaling functions. (English. English summary)

The functional and harmonic analysis of wavelets and frames (*San Antonio*, *TX*, 1999), 93–130, *Contemp. Math.*, 247, *Amer. Math. Soc.*, *Providence*, *RI*, 1999.

The cascade algorithm is defined by iteration of the operator $M(\psi)(x) = \sqrt{2}\sum_{k=0}^{N} a_k \psi(2x-k)$. This paper contains a review, with some new proofs, of the relation between the convergence in $L^2(\mathbf{R})$ of the cascade and the spectral properties of a transfer operator associated with the coefficients a_k. It is assumed that the coefficient sequence a_k is finitely supported with orthonormal even translates and $\sum_k a_k = \sqrt{2}$ and that the initial function for the iteration has orthonormal integer translates. The four-coefficient case is then treated in detail and a very careful numerical treatment of the cascade iteration is performed for coefficient sequences close to the example $a = (1/\sqrt{2}, 0, 0, 1/\sqrt{2})$, for which the cascade fails to converge in $L^2(\mathbf{R})$.

{For the entire collection see MR 2000j:42001.}

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