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Convergence of the cascade algorithm at irregular scaling functions. (English. English summary)
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 \( L^2(\mathbb{R}) \) 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 \( L^2(\mathbb{R}) \).
{For the entire collection see MR 2000j:42001.}
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