Wang, Cui; Deng, Caixia; Liu, Guoning; Chen, Xiaxia
The reproducing kernel function of image space of a dyadic wavelet transform. (Chinese. English summary) [Zbl 07366907]

Summary: Firstly, this paper constructs a dyadic wavelet with non-orthogonality, symmetry, limited spectrum and full smooth almost everywhere, discusses the dual wavelet and its properties, and gets the isometric and the estimation of the dyadic wavelet transform. Secondly, the analytic expression of the reproducing kernel function of image space of the dyadic wavelet transform is obtained by using the reproducing kernel Hilbert space theory. When the scale factor is fixed, the reproducing kernel function of image space of the dyadic wavelet transform is further characterized. Reproducing kernel illustrates the redundancy of wavelet transform so that the dyadic wavelet transform can be represented by reproducing kernel. Finally, different forms of expansion of dyadic wavelet transform are given, and the inverse formula of dyadic wavelet transform is obtained by using dyadic dual wavelet. The proposed theorems not only provide a reference for the study of image space of general wavelet transform, but also provide a theoretical basis for the numerical calculation of wavelet in engineering applications.

MSC:
42C40 Nontrigonometric harmonic analysis involving wavelets and other special systems
46E22 Hilbert spaces with reproducing kernels (= (proper) functional Hilbert spaces, including de Branges-Rovnyak and other structured spaces)

Keywords:
dyadic wavelet; wavelet transform; dual wavelet; reproducing kernel; inverse formula