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A Parseval equation and a generalized finite Hankel transformation. (English) Zbl 0763.46028
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For $\mu \geq -\frac{1}{2}$ a space S_μ of certain C^∞ - functions on $]0, 1]$ and a sequence space L_μ are introduced. If J_μ denotes the Bessel function of first kind and order μ and if $(\lambda_n)_{n \in \mathbb{N}_0}$ denotes the positive roots of J_μ (arranged increasingly) then the finite Hankel transform

$$(h_\mu^* f)(n) := 2J_{\mu+1}^{-2}(\lambda_n) \int_0^1 J_\mu(\lambda_n x) f(x) dx, \quad f \in S_\mu, \quad \mu \in \mathbb{N}_0,$$

is shown to be an isomorphism between S_μ and L_μ . Then the generalized finite Hankel transform $h'_\mu : S'_\mu \rightarrow L'_\mu$ is defined as the adjoint of $(h_\mu^*)^{-1}$ and it is shown that it extends a previous definition given in the literature.

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MSC:

- 46F12 Integral transforms in distribution spaces
- 44A15 Special integral transforms (Legendre, Hilbert, etc.)

Keywords:

Bessel function of first kind; generalized finite Hankel transform

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