

[Do, Minh N.](#); [Vetterli, Martin](#)

The finite ridgelet transform for image representation. (English) Zbl 1283.94011
IEEE Trans. Image Process. 12, No. 1, 16-28 (2003).

From the authors' abstract: The ridgelet transform was introduced by *E. J. Candès* and *D. L. Donoho*, *Philos. Trans. R. Soc. Lond., Ser. A, Math. Phys. Eng. Sci.* 357, No. 1760, 2495–2509 (1999; [Zbl 1082.42503](#)) as a sparse expansion for functions on continuous spaces that are smooth away from discontinuities along lines. In this paper, the authors propose an orthonormal version of the ridgelet transform for discrete and finite-size images. The construction uses the finite Radon transform (FRAT) [*E. D. Bolker*, *Contemp. Math.* 63, 27–50 (1987; [Zbl 0615.44004](#)); *F. Matus* and *J. Flusser*, *IEEE Trans. Pattern Anal. Mach. Intell.* 15, No. 10, 996–1006 (1993)] as a building block. To overcome the periodization effect of a finite transform, they introduce a novel ordering of the FRAT coefficients. Taking the one-dimensional wavelet transform on the projections of the FRAT in a special way results in the finite ridgelet transform (FRIT), which is invertible, non-redundant, and computed via fast algorithms. Furthermore, their construction leads to a family of directional and orthonormal bases for images. Numerical results show that the FRIT is more effective than the wavelet transform in approximating and denoising images with straight edges.

Reviewer: [Olaf Ninnemann \(Berlin\)](#)

MSC:

- [94A08](#) Image processing (compression, reconstruction, etc.) in information and communication theory
- [42C40](#) Nontrigonometric harmonic analysis involving wavelets and other special systems
- [94A11](#) Application of orthogonal and other special functions

Cited in **27** Documents

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