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Fractional Fourier Transform

This entry contributed by Haldun M. Ozaktas

The fractional powers $\mathcal{F}^a$ of the ordinary Fourier transform operation $\mathcal{F}$ correspond to rotation by angles $a\pi/2$ in the time-frequency or

space-frequency plane (phase space), and have many applications in signal processing and optics. So-called fractional Fourier domains correspond to oblique axes in the time-frequency plane, and thus the fractional Fourier transform (sometimes abbreviated FRT) is directly related to the Radon transforms of the Wigner distribution and the ambiguity function. Of particular interest from a signal processing perspective is the concept of filtering in fractional Fourier domains. Physically, the transform is intimately related to Fresnel diffraction in wave and beam propagation and to the quantum-mechanical harmonic oscillator.

SEE ALSO: Ambiguity Function, Discrete Fourier Transform, Fourier Transform, Phase Space, Radon Transform, Time-Space Frequency Analysis, Wigner Distribution

References

Ozaktas, H. M.; Zalevsky, Z.; and Kutay, M. A. *The Fractional Fourier Transform, with Applications in Optics and Signal Processing.* New York: Wiley, 2000. `http://www.ee.bilkent.edu.tr/~haldun/wileybook.html`

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