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Fractional Fourier transform as a signal processing tool: An overview of recent developments

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Abstract

Fractional Fourier transform (FRFT) is a generalization of the Fourier transform, rediscovered many times over the past 100 years. In this paper, we provide an overview of recent contributions pertaining to the FRFT. Specifically, the paper is geared toward signal processing practitioners by emphasizing the practical digital realizations and applications of the FRFT. It discusses three major topics. First, the manuscripts relates the FRFT to other mathematical transforms. Second, it discusses various approaches for practical realizations of the FRFT. Third, we overview the practical applications of the FRFT. From these discussions, we can clearly state that the FRFT is closely related to other mathematical transforms, such as time–frequency and linear canonical transforms. Nevertheless, we still feel that major contributions are expected in the field of the digital realizations and its applications, especially, since many digital realizations of

the FRFT still lack properties of the continuous FRFT. Overall, the FRFT is a valuable signal processing tool. Its practical applications are expected to grow significantly in years to come, given that the FRFT offers many advantages over the traditional Fourier analysis.



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Keywords

Fractional Fourier transform; Time–frequency; Discrete realizations; Applications

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