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The convolution-based windowed free metaplectic transform

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In this paper, we introduce a novel time-frequency representation tool coined as the convolution-based windowed free metaplectic transform (CWFMT) by combining the merits of free metaplectic transform (FMT) and window transform via free metaplectic convolution. First, the definition of the proposed transform is given and some related properties like Parseval's formula, inversion theorem and the characterization of range of this transform are obtained. Second, the generalized convolution theorem for CWFMT is proposed by employing the convolution structure in window function as well.

Keywords: Free metaplectic transform; symplectic matrix; metaplectic convolution; convolution-based windowed free metaplectic transform.

AMS Subject Classification: 42C40, 44A35, 42B10, 53D22, 65R10

1. Introduction

Folland *et al.*^[7] introduced a multi-dimensional integral transform coined as the free metaplectic transform. The free metaplectic transform, being a general form of integral transform, is a remarkable addition to the set of integral transforms, encompassing various transforms such as Fourier transform, fractional Fourier transform, Fresnel transform, and even fundamental operations of phase factor multiplication

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