

论文

基于一种新的交换矩阵的离散分数阶傅立叶变换实现

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摘要:

分数阶傅立叶变换比傅立叶变换更具有一般性, 多年来引起人们深入研究。由于连续分数阶傅立叶变换在工程实现时都要抽样离散化, 直接对连续分数阶傅立叶变换的核离散化会失去很多重要的性质, 因此人们研究它的离散实现并保持它具有与连续分数阶变换同样的性质。本文提出了一种新的交换矩阵实现离散分数阶傅立叶变换, 其变换的离散核矩阵与连续变换的分数阶傅立叶变换核有相似性, 诸如酉特性、可加性、正交性和可逆性。仿真结果证实了所提出的分数阶傅立叶变换核与连续分数阶傅立叶变换核的相似性以及两种变换对矩形信号这种典型信号的分数阶傅立叶变换的相似性。

关键词: 交换矩阵 酉特性 傅立叶变换 分数阶傅立叶变换

Realization of Discrete Fractional Fourier Transform Based on a Newly Commuting Matrix

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Abstract:

For many years, the fractional Fourier Transform (FRFT) is deep investigated because of a generalization of the conventional Fourier transform. The engineering realization of the continuous FRFT has to be sampled and discretized, and such an achieved core matrix will lose many important properties. Thus, people have done many researches on the discrete realization of the core matrix of the continuous FRFT. In this paper, a newly commuting matrix is proposed to implement the discrete fractional transform (DFRFT). The core matrix of the DFRFT resulted from the presented commuting matrix has the similar properties with the core of the continuous fractional Fourier transform, such as unitary, additive, orthogonal, reversible. Finally, the simulation results have shown the similarity of the core matrix of the proposed DFRFT and the core function of continuous FRFT, and the similarity of two FRFTs of rectangular signal.

Keywords: Commuting matrix Unitary Fourier transform Fractional Fourier transform

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