

Title: A Unifying Decomposition and Reconstruction Model for Discrete Signals

题目: 数字信号的一种通用分解和重建模型

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Abstract:

Decomposing discrete signals (such as images) into components is vital in many applications, and this paper proposes a framework to produce filtering banks to accomplish this task. The framework is an equation set which is ill-posed, and thus have many solutions. Each solution can form a filtering bank consisting of two decomposition filters, and two reconstruction filters. Especially, many existing discrete wavelet filtering banks are special cases of the framework, and thus the framework actually makes the different wavelet filtering banks unifiedly presented. Moreover, additional constraints can impose on the framework to make it well-posed, meaning that decomposition and reconstruction (D&R) can consider the practical requirements, not like existing discrete wavelet filtering banks whose coefficients are fixed. All the filtering banks produced by the framework can behave excellently, have many decomposition effect and precise reconstruction accuracy, and this has been theoretically proved and been confirmed by a large number experimental results.

Significance Statement:

- 1) An equation set model is proposed, and any solution of model can act as the coefficients of D&R filters;
- 2) Existing discrete wavelet filters (such as Daubechies, Coiflets, Symlets, Meyer, etc) are solutions of the model, and simultaneously many other D&R filters can get from the model

- 3) Special constraints can be additional imposed on the model, making the D\&R filters applicable to flexible practical requirements contrasted with existing wavelet filters whose coefficients are fixed.

报告摘要:

建立了一个方程组模型，该模型的解能构成分解和重建信号的滤波器，现有的离散小波滤波器都是该模型的解，并且通过该模型可以发现大量的分解和重建滤波器。该模型欠定，通过添加实用约束，可按照功能需求对信号进行分解和重建。