

Sparse Volume Reconstruction Based on Haar Wavelet Techniques

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The goal is to reconstruct 3D computed tomography (CT) volumes that are locally constant. By doing this in the Haar wavelet basis, we can save memory because the thresholding/compression step is integrated into the reconstruction. We consider classical iterative methods like the Algebraic Reconstruction Technique (ART), its randomized version, the Iterative Shrinking-Thresholding Algorithm (ISTA) and its modification Fast ISTA (FISTA).

The idea is a multilevel reconstruction where only the relevant coefficients are kept before advancing to the next resolution level. This enables local refinement and leads to a monotone sequence of finer grids where the data is reconstructed. The reconstruction steps itself consist of applying standard methods (ART, ISTA...) onto the data on the current grid. Iterating through the resolution levels, the grid approaches the maximal resolution while being as sparse as possible. First results on synthetic data look promising.

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