Jing, Zhucui; Li, Ming

Summary: Cryo-electron microscopy (cryo-EM) single particle method (SPM) reconstructs the three-dimensional (3D) density map of biological macromolecules using 2D particle images with estimated orientations. The estimated orientations have errors which result in the decrease in resolution of the reconstructed map. We propose a wavelet orthonormal bases based iteration method by refining alternatively the orientations and the map using Levenberg-Marquardt algorithm and soft-thresholding, respectively. The convergence analysis of the proposed algorithm is provided and numerical experiments for simulated particle images show its good performance.

MSC:
94A08 Image processing (compression, reconstruction, etc.) in information and communication theory
68U10 Computing methodologies for image processing
65T60 Numerical methods for wavelets
42C40 Nontrigonometric harmonic analysis involving wavelets and other special systems

Keywords:
alternating-direction method; convergence analysis; inverse problem; nonlinear least squares; Haar wavelet

Software:
XMIPP; EMan; FREALIGN

Full Text: DOI

References:

This reference list is based on information provided by the publisher or from digital mathematics libraries. Its items are heuristically matched to zbMATH identifiers and may contain data conversion errors. It attempts to reflect the references listed in the original paper as accurately as possible without claiming the completeness or perfect precision of the matching.