Lens-Free Imaging with Computational Optical Methods

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Abstract: We propose a high-fidelity LFOCM method that integrates pixel super-resolution (PSR) with dynamic dual-channel noise separation (DCNS). A structured illumination microscopy technique is designed based on the Kramers-Kronig relations (KK-SIM) that achieves quantitative phase imaging without the need for extra technical assistance and relies solely on the spatial-domain intensity images reconstructed through conventional SIM. A novel approach is given for wavefront reconstruction by a laterally moving lens, in conjunction with amplitude-phase retrieval. Compared to axial multiple-image phase retrieval methods, the proposed lateral methodology exhibits superiority of accuracy. A novel four frame super-resolution method specifically tailored was researched for lensless imaging systems.

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