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A spatial ptychographic phase retrieval algorithm for microscopic implementation in the NIR

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The use of spatial ptychography, a lensless imaging technique, in microscopy is well established. A ptychographical iterative engine (PIE) is a phase retrieval algorithm used to reconstruct the amplitude and phase of the sample from its far-field diffraction patterns. This holds some advantages over conventional imaging. In this work, the PIE algorithm described uses, as input, the diffraction patterns recorded by illuminating a sample at various spatial positions with a 975 nm diode laser. The iterative algorithm reconstructs the image by allowing the phase to converge in the overlap regions between neighbouring illumination positions. This method implies that the resolution of this technique is not limited by optical elements in the setup such as lenses, but rather by the highest spatial frequency that can be recorded. An extension to the PIE is the ePIE (extended ptychographical iterative engine). In ePIE the probe beam used to illuminate the sample is also reconstructed, allowing for a faster reconstruction of the image and no a priori knowledge of the probe beam. Shown and discussed here are preliminary simulations that demonstrate this technique, as well as the setup of a ptychographic microscope.

Apply to be considered for a student award (Yes / No)?

Yes

Level for award (Hons, MSc, PhD, N/A)?

MSc

Main supervisor (name and email) and his / her institution

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Would you like to submit a short paper for the Conference Proceedings (Yes / No)?

No

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