LICENSING OPPORTUNITY: TOMOGRAPHIC RECONSTRUCTION APPARATUS AND REMOVING DIFFRACTION EFFECTS IN A TOMOGRAPHIC IMAGE

DESCRIPTION

Problem

Typical current tomographic reconstruction algorithms either ignores diffraction entirely or treats only a single wavelength and does not have a principled theory of partial coherence. These can lead to unphysical reconstructions of high and low densities near material boundaries.

Invention

The invention is a method for creating improved tomographic reconstructions in the presence of diffraction. The new feature is the recognition that it is possible to make an iterative method which has the same scaling in computation time as projective tomography.

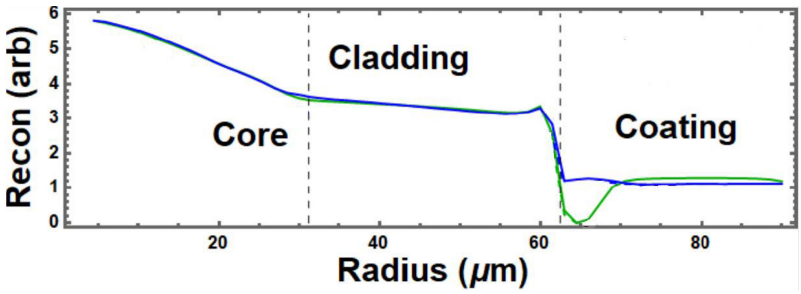
BENEFITS

Potential Commercial Applications

- High-Resolution Medical and Dental Imaging
- High-Resolution Biological Imaging
- Industrial Metrology & Inspection
- Materials Science
- Pharmaceutical Industry
- Geological & Oil/Gas Applications

Competitive Advantage

The method is applicable to lower Fresnel number than current methods, but does not require the far field limit used in ptychography. The method gives superior resolution of abrupt edges between materials of different density. Such differences are extremely common in both engineered and natural systems.



Radial averages of conventional (green) and Fresnel-aware (blue) reconstruction of an optical fiber are given. Although both methods do a good job on the increased density in the germanium-doped silica core which holds an optical beam in place, the dip in density near the boundary of the silica cladding and the acrylate coating for the conventional reconstruction is an artifact which does not appear in the Fresnel case. Image segmentation software is likely to be much more successful if the reported densities correspond to physical boundaries in the material. Graph redrawn from Z. H. Levine et al. "X-ray computed tomography using partially coherent Fresnel diffraction with application to an optical fiber." Optics Express 29, 1788-1804 (2021).

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