X-Ray Grating Tomography without Phase-Retrieval using Spherically Symmetric Basis Functions

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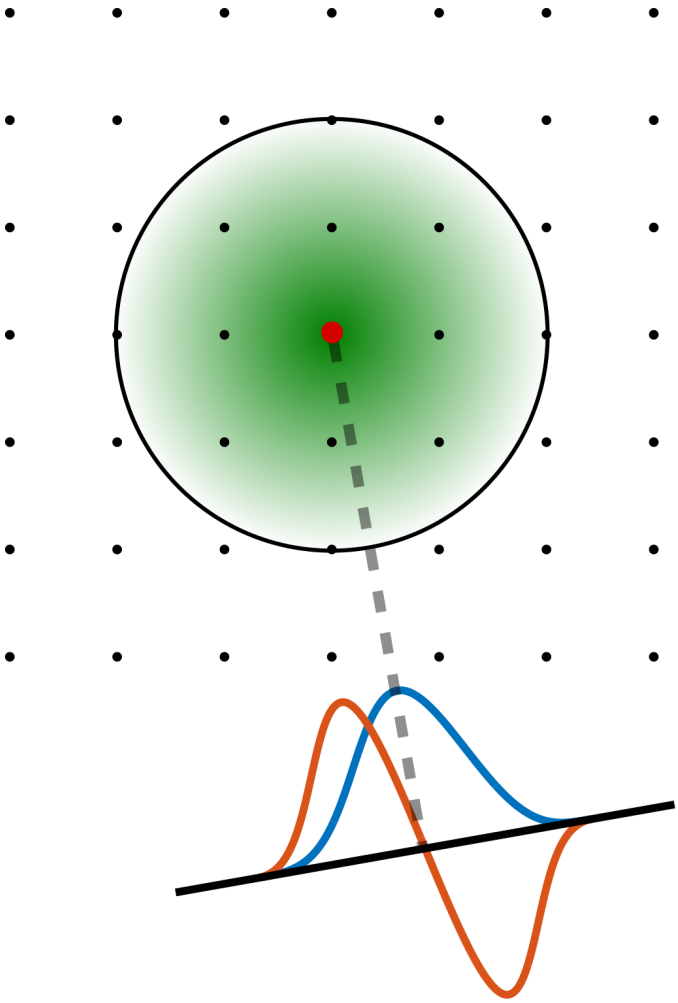

Figure: *Illustration of a blob-based forward projection. A sample blob has a support given by the black circle and its energy - as indicated in green - is distributed around the center (red). The traditional (blue) and differential (orange) footprint depends only on the forward projection of the blob's center onto the detector.*

Traditional Talbot-Lau X-ray Phase-Contrast tomography requires prior phase-retrieval based on - for instance - G2 stepping. Since several exposures per projection angle are required, high dose needs to be applied and simple integration into a continuously rotating gantry is cumbersome.

By modelling the phase-contrast image formation process using the object's attenuation, refractive and small-angle scattering properties, a maximum-likelihood-based algorithm is applied for tomographic reconstruction without the need of prior phase-retrieval [1]. Previous research has shown that a tomographic acquisition with only one phase-step per projection angle suffices using the proposed algorithm [2].

The choice of radial symmetrical image basis functions for iterative reconstruction has drawn particular interest to the Phase-Contrast community due to the analytical solution of the Radon transform and its differential footprint [3]. Thus discretization artifacts due to numerical differentiation are avoided implying a positive impact on the reconstruction result.

In this work we show reconstruction results of Talbot-Lau grating tomography using Kaiser-Bessel functions [4].

References

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