

Kolloquium

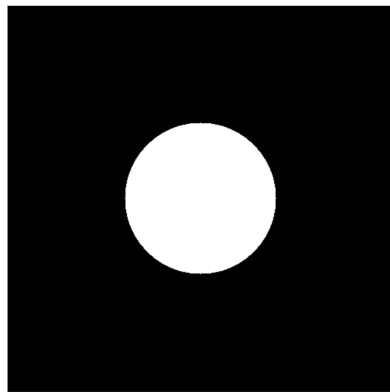
Institut für Mathematik

Universität Innsbruck

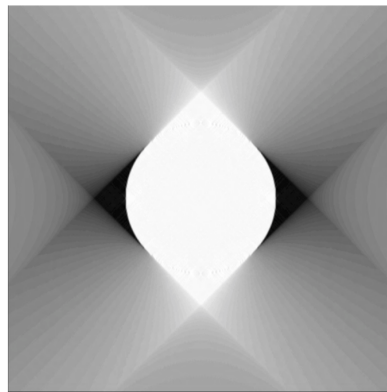
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Tomographic reconstructions from incomplete data

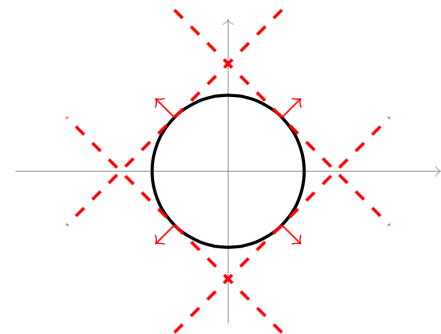
We consider the reconstruction problem of x-ray tomography for the case that the measured data is incomplete. Such problems arise naturally in applications like digital breast tomosynthesis, dental tomography, electron microscopy etc. We explain why this reconstruction problem is severely ill-posed and discuss that the traditional reconstruction methods, such as filtered back projection (FBP), do not perform well in such situations. Moreover, we show that as a result of data incompleteness only specific features of the unknown object can be reconstructed reliably, and artifacts can be generated. We will use microlocal analysis to explain why and where artifacts can be generated. In particular, we will show that in x-ray tomography the artifacts might appear only along lines that are tangent to singularities of the original object. We will present a methodology to reduce these artifacts and show some numerical examples.



Original



Reconstruction for $[-\frac{\pi}{4}, \frac{\pi}{4}]$



Set of added singularities $\mathcal{A}_{\frac{\pi}{4}}$

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