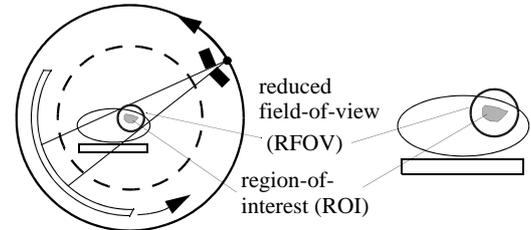


Context

Region-of-interest (ROI) computed tomography (CT) is the tomographic reconstruction from projections that are truncated laterally when the field-of-view does not fully cover the patient (see figure). Analytic reconstruction algorithms have been developed for ROI tomography in the past 20 years [1]. The purpose of the ANR ROI doré project is to investigate these algorithms for dose reduction while keeping an equivalent reconstructed image quality. This is a collaborative project between TIMC (Grenoble) and CREATIS (Lyon). Funding for a PhD fellowship will be available in 2018.



Objective

The purpose of this master internship is to develop an inversion algorithm for the truncated Hilbert transform [3]. This 1D inverse problem does not have (yet) an analytic solution and we will investigate an iterative solution. The resulting algorithm will be compared to conventional iterative reconstruction for the problem of 2D ROI CT [2]. The developments will use and enhance the Reconstruction Toolkit (RTK, <http://www.openrtk.org>).

Tasks

- Implement an inversion algorithm for the truncated Hilbert transform,
- Evaluate the reconstructed image quality on simulations,
- Compare the results to conventional iterative reconstruction.

Required skills

- **Education:** master student in applied maths or image processing.
- **Scientific interests:** applied maths, computer sciences (medical image processing), x-ray physics.
- **Programming skills:** Python, C++ (ITK, RTK).
- **Languages:** Command of English required, French optional.

Practical information

- **Supervision:** Simon Rit
- **Location:** Centre Léon Bérard, Lyon, France, with regular meetings in Grenoble.
- **Period:** 2018 (duration negotiable).
- Send CV, master marks and a brief statement of interest by email to Simon Rit (simon.rit@creatis.insa-lyon.fr).

References

- [1] R. Clackdoyle and M. Defrise. Tomographic reconstruction in the 21st century. region-of-interest reconstruction from incomplete data. 27(4):60–80, 2010.
- [2] R. Clackdoyle, F. Noo, F. Momey, L. Desbat, and S. Rit. Accurate transaxial region-of-interest reconstruction in helical CT? *IEEE Transactions on Radiation and Plasma Medical Sciences*, 1(4):334–345, July 2017.
- [3] M. Defrise, F. Noo, R. Clackdoyle, and H. Kudo. Truncated hilbert transform and image reconstruction from limited tomographic data. *Inverse problems*, 22(3):1037, 2006.