



Citation for published version:
Soleimani, M 2022, 'The Art of the Iterative XCT Image Reconstruction'.

Publication date:
2022

Document Version
Peer reviewed version

[Link to publication](#)

University of Bath

Alternative formats

If you require this document in an alternative format, please contact:
openaccess@bath.ac.uk

General rights

Copyright and moral rights for the publications made accessible in the public portal are retained by the authors and/or other copyright owners and it is a condition of accessing publications that users recognise and abide by the legal requirements associated with these rights.

Take down policy

If you believe that this document breaches copyright please contact us providing details, and we will remove access to the work immediately and investigate your claim.

The art of the iterative XCT image reconstruction

M Soleimani

Engineering Tomography Laboratory (ETL), Department of Electronic and Electrical Engineering,
University of Bath, Bath BA2 7AY, m.soleimani@bath.ac.uk

Abstract:

Cone beam computed tomography (CBCT) enables a volumetric image reconstruction from a set of 2D projection data. The image reconstruction problem is very large-scale inverse problem. Traditional, single step method such linear back projection in CBCT's case the FDK method is used. Although very fast, the single step methods cannot provide sufficient image quality with limited projection and limited angle data. They are not very good at dealing with noisy projection data that could come from fast data collection for example. We have implemented a wide range of algebraic iterative algorithms, or so-called algebraic reconstruction techniques (ART). Originally ART algorithms are based on Kaczmarz method; but the name ART originates from important paper from Gordon, Bender and Herman. The performance of various ART type algorithms such as SIRT, SART and OS-SART, and high order methods such as conjugate gradients (CG) and several total variational based methods is studied based on a range of image quality measures. The major limitations of the iterative methods are their computational time. We discuss the implementation of these algorithm in multi-CPU computing in our group and later on in multi-GPU platform leading to an open software toolbox TIGRE a collaborative project between University of Bath and CERN.