Contrast of Two Methods of Reconstruction of CT Images Using High Performance Computing

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Abstract

Algebraic methods are more suitable for the reconstruction of images with high contract and precision in noisy conditions and from a small number of projections. Their use may be important in portable scanners for their functionality in emergency situations. However, presently, the reconstruction process in clinical scanners is based on analytical algorithms which use the inverse Fourier transform, and the algebraic methods are less used due to their high computational cost.

Nevertheless, the algebraic methods represent a dominant option due to two reasons. First, the analytical methods require completed data collection which is not always possible. Second, they do not provide the optimal reconstruction in noisy conditions in the image.

Algebraic methods allow reconstructing images with higher contrast and precision in noisy conditions from a small number of projections than the methods based on Fourier transform.

In X-ray computed tomography (CT), it is common to find incomplete set of no equally spaced projections. In these cases, algebraic reconstruction methods provide images with better quality.

In this work it is analyzed and proposed the usage of the PETSc (Portable Extensive Toolkit for Scientific computation) library for the optimal usage of a system in parallel reconstruction of images with iterative methods. Also, the quality comparison of the images reconstructed with both methods, analytical Filtered Back Projection (FBP) and iterative Least Square QR, has been performed.