A package for 3D reconstruction with Matrix Implementation of tomographic algorithms on GPUs

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Description:

The program TOMO3DGPU uses a matrix approach to reconstruct tomograms from aligned tilt series. This program has the most common reconstruction methods implemented, namely WBP and SIRT. The program exploits NVIDIA GPUs with compute capability 1.1 and higher. The combination of the matrix approach and GPU computing allows ultrafast 3D reconstruction. The program reads input tilt-series and writes output tomograms in MRC format. The program is compatible with standard packages, which allows easy integration in the electron tomography workflow.

A detailed description of the procedure implemented in the package can be found in the following articles:

A matrix approach to tomographic reconstruction and its implementation on GPUs.
F Vazquez, EM Garzon, JJ Fernandez.
Journal of Structural Biology 170:146-151, 2010.

Matrix Implementation of Simultaneous Iterative Reconstruction Technique (SIRT) on GPUs.
F Vazquez, EM Garzon, JJ Fernandez.
The Computer Journal, in press, 2011.
doi: 10.1093/comjnl/bxr033

Please, cite these articles if you use TOMO3DGPU in your works.

Requirements:

Execution of the program requires to have CUDA installed, including Cuda runtime (libcudart) and Cuda FFT (libcufft).

Usage:

tomo3dgpu   [-z thickness] [-g gpu] [-s symmetry_level] [-S] [-i sirt_iterations]
                       <tilt_file> <input_tiltseries> <output_rec3d>

With:

Mandatory parameters:

<tilt_file>   : Tilt angle file in IMOD convention.

<input_tiltseries>   : Input tilt series in IMOD format (MRC format, MODE 0, 1, 2)

<output_rec3d>   : Output tomogram.

Options:

[-z thickness]   : It allows the user to specify the thickness of the tomogram (in voxels).
                      By default, a cube reconstruction is computed.

[-g gpu]   : GPU to use. By default, the fastest GPU is taken.

[-s symmetry_level] : Symmetry level. By default, level 2 is used.
                      (see our articles for more information about it)

[-S]   : Flag to activate computation of SIRT.
                      By default, WBP is used.

[-i iterations]   : Iterations of SIRT.
                      By default, 30 iterations is computed.
                      This option only makes sense if '-S' is used as well.