Download and Installation

Download a release from the CTS github page. Unzip the archive into your matlab/toolbox folder, and add the resulting CTS folder to your Matlab path. Currently, adding subfolders is irrelevant as CTS has none. IMOD must also be installed to run simulations and reconstructions.

CTS requires a matlab version 2019b or later, and the image processing and statistics & machine learning toolbox. These are standard with most matlab licenses. CTS also requires the [EMIOD toolbox](https://github.com/rbehrouzi/emtoolbox) for matlab, installed in the same way.

Download at least one structure file from a database such as the RCSB for testing. Cif files are preferred as they have a few very useful features, but pdb files are perfectly serviceable.

Minimal commands for a basic simulation

The first command generates a model. It will prompt with a GUI to select the structure files to include in the model, in this case as a single layer. The model has a size of 300x400x50 voxels, and a pixel size of 12 angstroms. An output folder will be generated in the /tomosim folder in your home directory, with a name including the input structures. Estimated runtime: <2 minutes

[cts] = cts\_model(zeros(300,400,50),{12});

You can view the generated model with the following. A carbon hole edge should run along the left side.

sliceViewer(cts.vol);

The second command simulates a tiltseries and reconstructs it given an existing model. This prompts with a GUI to select a model generated by cts\_model – either the mrc or .mat in the session folder will generate a simulation, but always select the .mat file as that is required for creating the atlas. You can replace ‘gui’ with the full path to the model .mat file as well. Estimated runtime: <1 minute

cts\_simulate('gui','suffix','tutorial1');

The simulation outputs will be in a folder with the suffix ‘\_tutorial1’, in the source model folder. The easiest way to view all the steps in series is with IMOD’s 3dmod command. The 5\_recon\_X.mrc file is the final tomogram, and atlas\_X.mrc is the class atlas.

List of functions

Model param

Model

Simulate param

simulate