Data processing for diSPIM images: an overview

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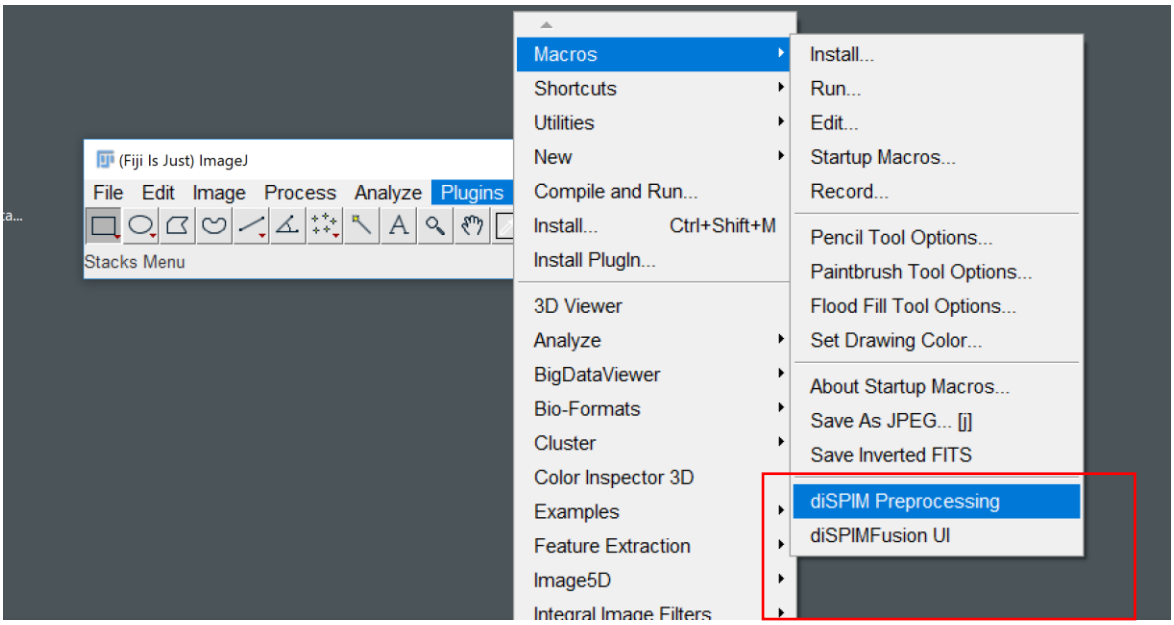
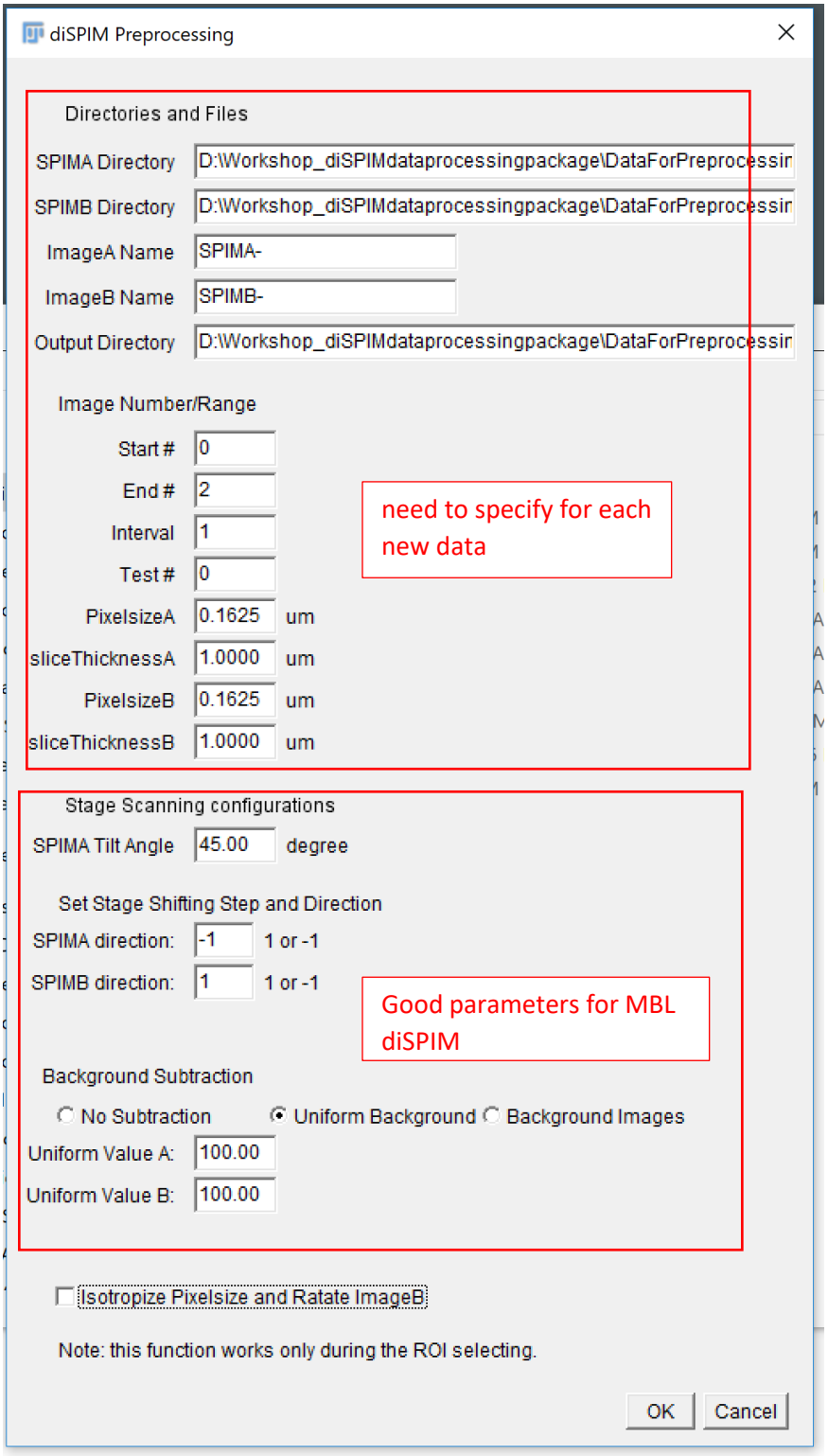
Aiming to get a final image with 3D isotropic resolution, registration and deconvolution are usually applied to the two view images of diSPIM. But before the registration, data preprocessing is also need to handle the raw dada, such as background subtraction, region of interest (ROI) cropping and 3D orientation arranging. Additionally, the stage-scanning acquisition introduces distortion to the 3D raw images with regards to the regular light-sheet scanning acquisition. We'll need to correct this distortion before we can further fuse these the views and get a final deconvolved image (please see our paper on this topic https://www.ncbi.nlm.nih.gov/pubmed/27638693). So, the processing for diSPIM images should mainly include two parts: preprocessing and fusion. Accordingly, we have written appropriate programs: an image preprocessing program and a GPU-based CUDA/C++ program to fuse the two views (including image registration and joint deconvolution). The software have been onto the MBL workstation and there is detailed description and user manual for each program, but I'd like to specify some the configurations and parameters for MBL diSPIM.



1) The image preprocessing macro.

"diSPIM_Preprocessing.ijm" is an imageJ macro which aims to correct the images distortion. It is supposed to work for both iSPIM (single-view imaging) and diSPIM (dual-view imaging). But somehow, we have not added the function for iSPIM yet. But it should be all right for single color or dual color diSPIM processing. The macro, the test data and the user manual should be contained within the diSPIM Data Processing Package. Specifically, datasets in the folder "TestDataForPreprocessing" were acquired during the MBL diSPIM imaging workshop, they should be good examples for the macro. Users can find a log file in the benchmark result folder ("Result_backup"), which contains the processing parameters of each dataset.

The macro is supposed to work within **Fiji that has ImageJ version 1.48c or later**, on a PC with the Windows 7 operation system. We have used it with good results within Fiji: Life-Line version, 2013 July 15, **Windows 7 (64-bit)**.



2) diSPIM fusion software.

To register the two view images and do the joint deconvolution, we provide another imageJ macro "diSPIMFusion_UI.ijm" that can also create a user interface. The macro calls some executable apps written with CUDA/C++. To run the software, the PC needs to have a) windows 7 or 10 operation system, b) either imageJ or Fiji and c) a graphics card supported by CUDA 7.5 and with appropriate drivers (Most nowadays graphics card in Nvidia should be compatible with CUDA 7.5 but better check here https://developer.nvidia.com/cuda-gpus). This software runs fast based on parallelized computation by GPU card, but the images size is limited by the GPU memory. For regular running, the GPU memory should be > 24 times of the image size (16-bit, after interpolation), with memory saved running, the GPU memory should be >12 times of the image size (16-bit, after interpolation). We also want to note that there is another diSPIM fusion software that does not need a GPU card, so image size is only limited by the CPU memory, but it runs much slower (MIPAV, GenerateFusion: http://dispim.org/software/mipav_generatefusion).