User manual for 3I-SIM reconstruction software

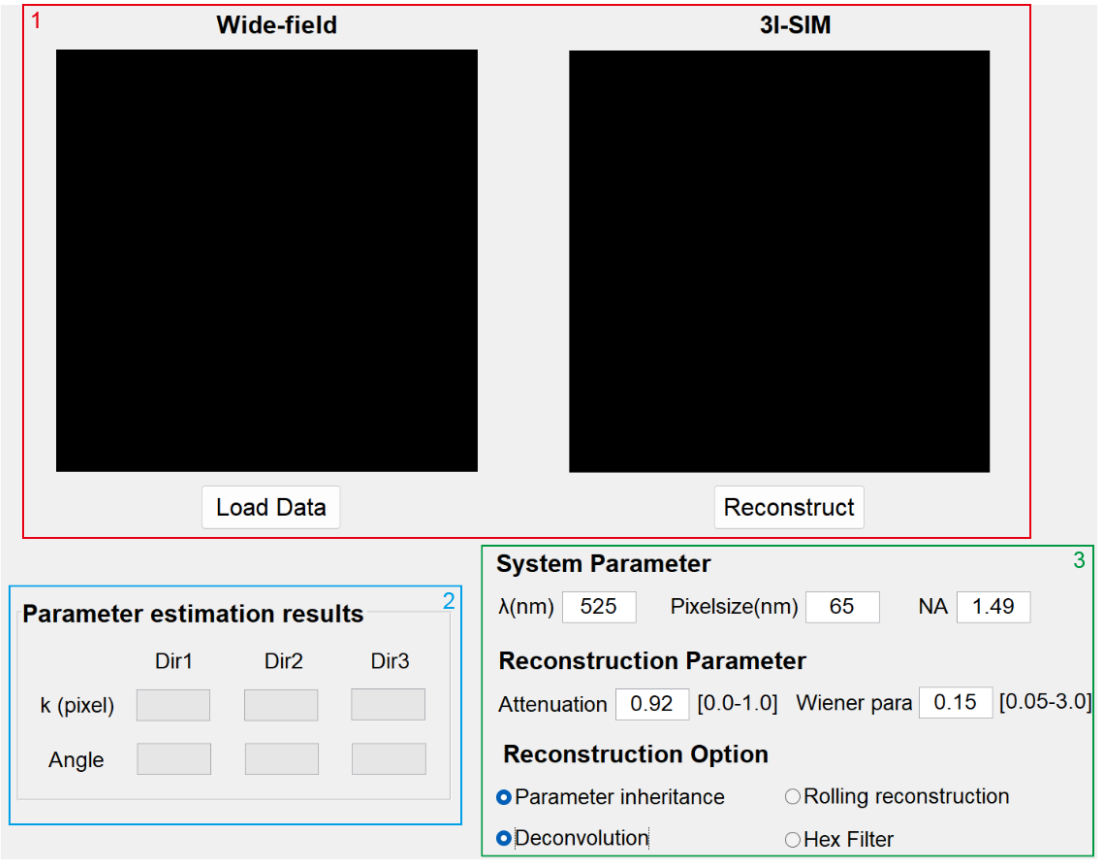
1. Abstract

This manual provides guidance for using the 3I-SIM reconstruction software, as part of the manuscript "*Triangle-beam interference structured illumination microscopy*". It is a software used to reconstruct SR-SIM image with hexagonal modulation through lattice sheet.

2. Installation

We provided both the MATLAB source code in the .m format and a .exe executable file format. The code was developed and tested in the MATLAB 2020b version. To run the MATLAB source code, it is required to install a complete MATLAB software, which is available at https://www.mathworks.com/products/matlab.html. To run the .exe file, it is only required to install a MATLAB Runtime 2020b compiler, which is freely available at https://www.mathworks.com/products/compiler/matlab-runtime.html.

3. Software interface



The software contains three regions:

- ***Region 1:*** The data loading and display region, which are used to load data and display the results.
- ***Region 2:*** The region displays the parameter estimation results.
- ***Region 3:*** The region for typing reconstruction parameters and choosing options.

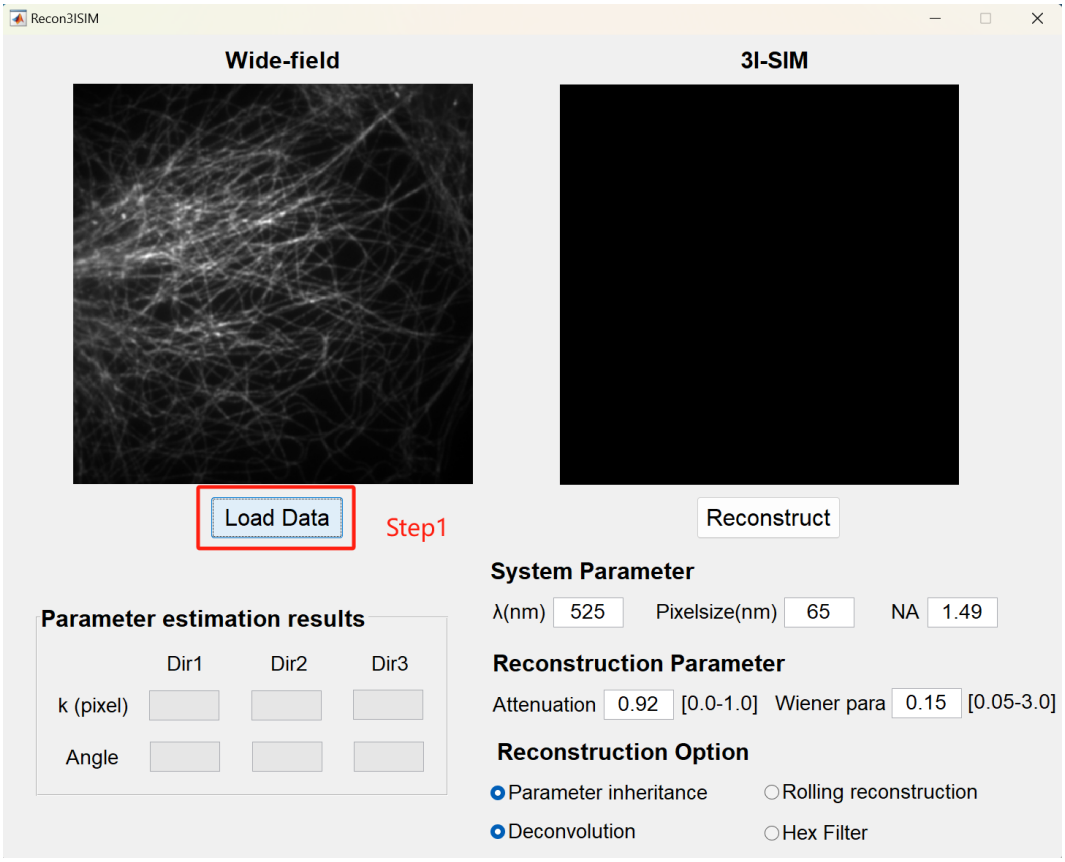
Details regarding parameters and options are as follows:

- ***λ (nm)*****:** The emission wavelength (typical value: 525-685 nm)
- ***Pixelsize (nm)*****:** The real pixel size of the image (typical value: 65 nm)
- ***NA*****:** The numerical aperture of the objective lens (typical value: 1.49)
- ***Attenuation*****:** The OTF attenuation parameter (typical value: 0.9-0.99)
- ***Wiener para*****:** The Wiener parameter used for Wiener deconvolution (typical value: 0.05-3.0)
- ***Parameter inheritance*****:** Decide whether to determine the illumination pattern using the superimposed time-lapse images.
- ***Rolling reconstruction:*** Decide whether to apply rolling reconstruction to time-lapse image stack
- ***Deconvolution:*** Decide whether to apply deconvolution to each reconstructed image
- ***Hex Filter:*** Decided whether to apply attenuation the shifted frequency point

4. Running procedure

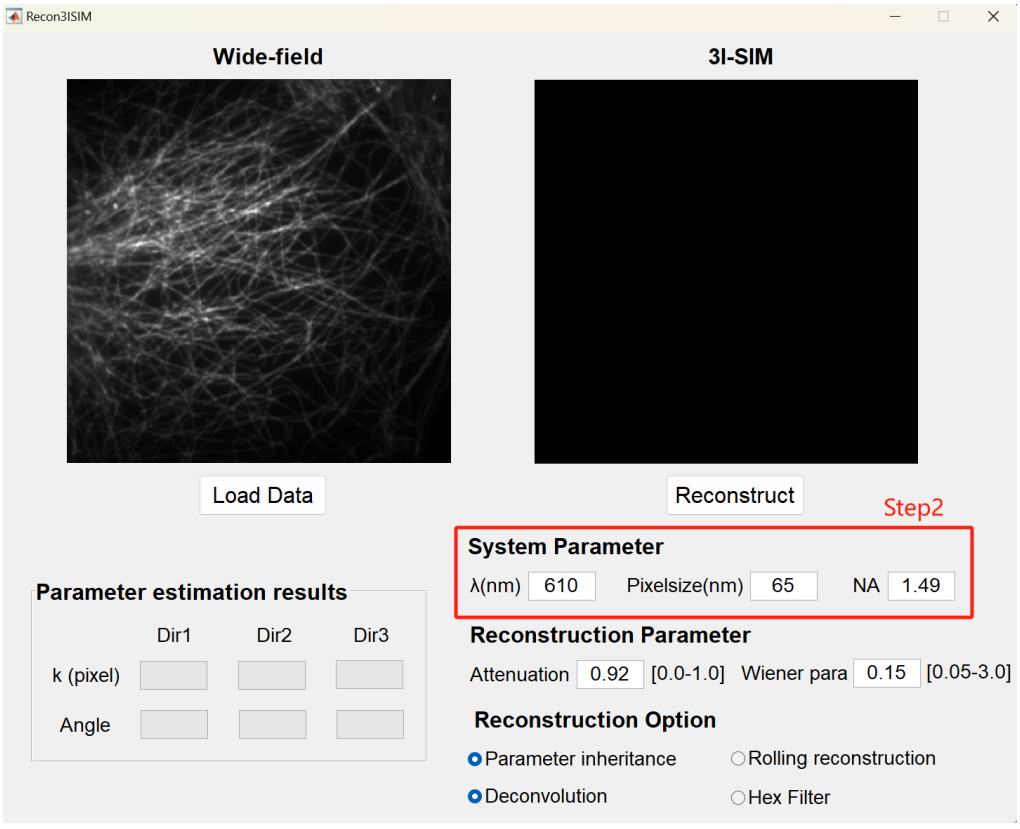
Step 1. Load the raw data

Click the load data button and select the raw 3I-SIM images to be reconstructed. The software supports typical image format such as .tif, .jpg and .png. For a single-frame 3I-SIM reconstruction, it requires 7 raw modulated images.



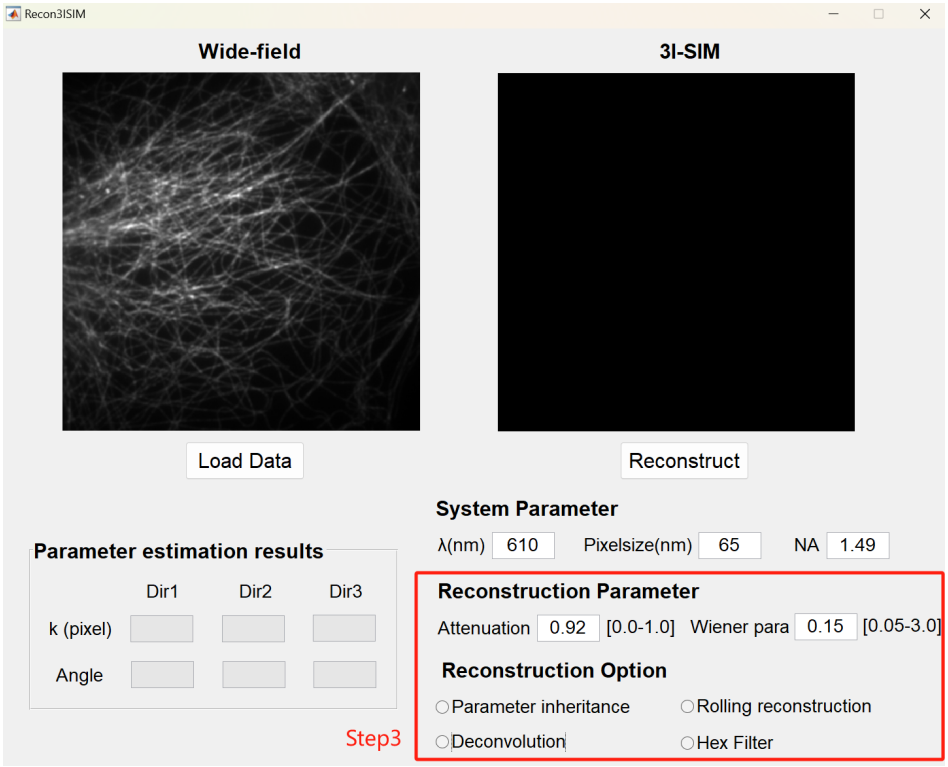
Step 2. Check the system parameter

Properly modify the parameters listed in the System Parameter column according to the imaging condition.



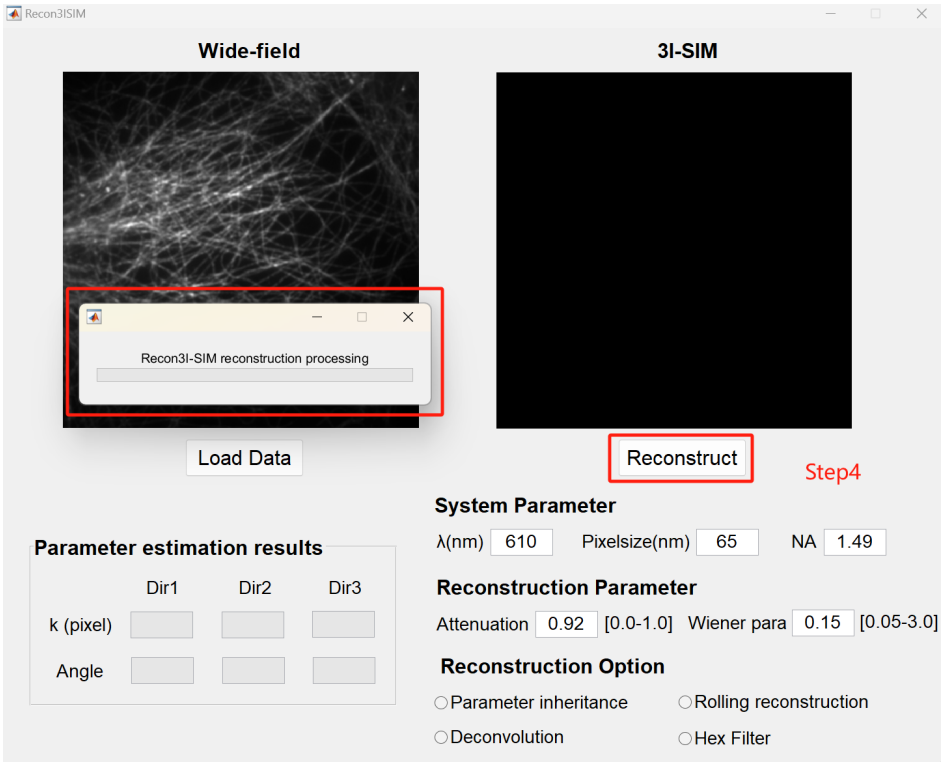
Step 3. Check the Reconstruction Parameter and Option

Check the Reconstruction Parameter and Option column according to reconstruction demands.



Step 4. Process data

Click the Reconstruct button and wait for the reconstruction.



Step 5. Check the results

Check and evaluate the results.