

Abstract:

Researchers are using IMOD and QSTEM for electron microscopy analysis and simulation in material science and biology science area. However, these tools are hard to install or use for beginners who are not familiar with computational skills. To overcome this issue, we develop "Online IMOD and STEM tool" to allow users to perform microscopy analysis and simulation with ease.

Introduction:

IMOD¹⁾ is a set of programs used for tomographic reconstruction and 3D visualization. It also contains image processing capabilities that can be widely used in biology and material science area.

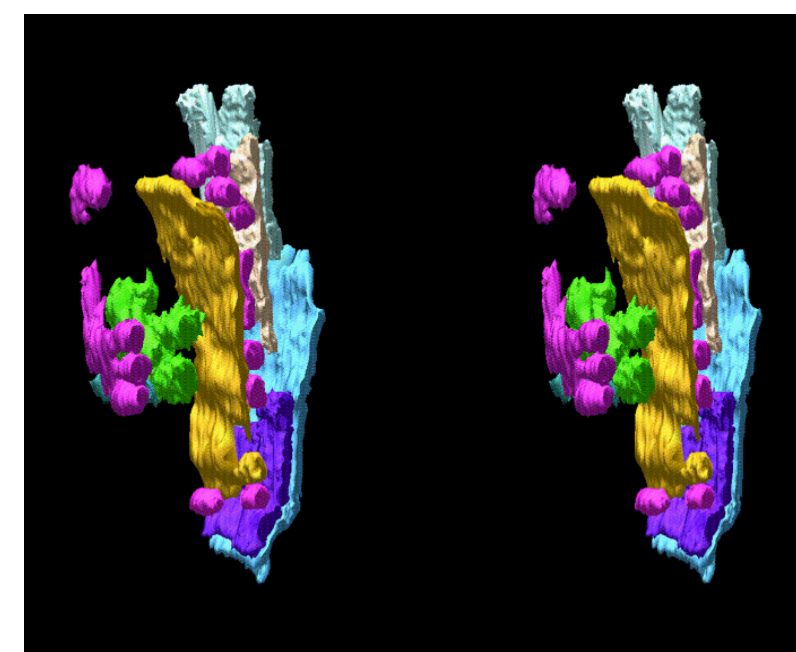


Figure 1: Visualized Tomogram using IMOD (NRK cell network)²⁾

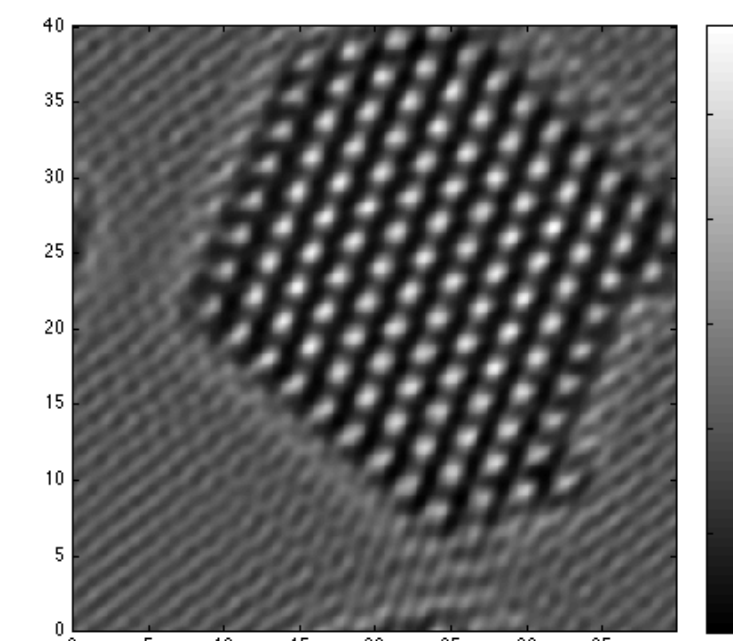


Figure 2: TEM Simulation result using QSTEM (Au nanoparticle)

QSTEM³⁾ is used for quantitative simulations of TEM and STEM images. QSTEM package contains useful built-in tools for crystal model generation (QSTEM Model Builder and Convert2CFG)

Objectives:

- To develop "easy and ready -to-use" interface for IMOD and QSTEM
- Operating System (OS) independent
- No hardware (CPU, memory) limitations
- No compilers, additional software (Cygwin etc.)
- No command line interface

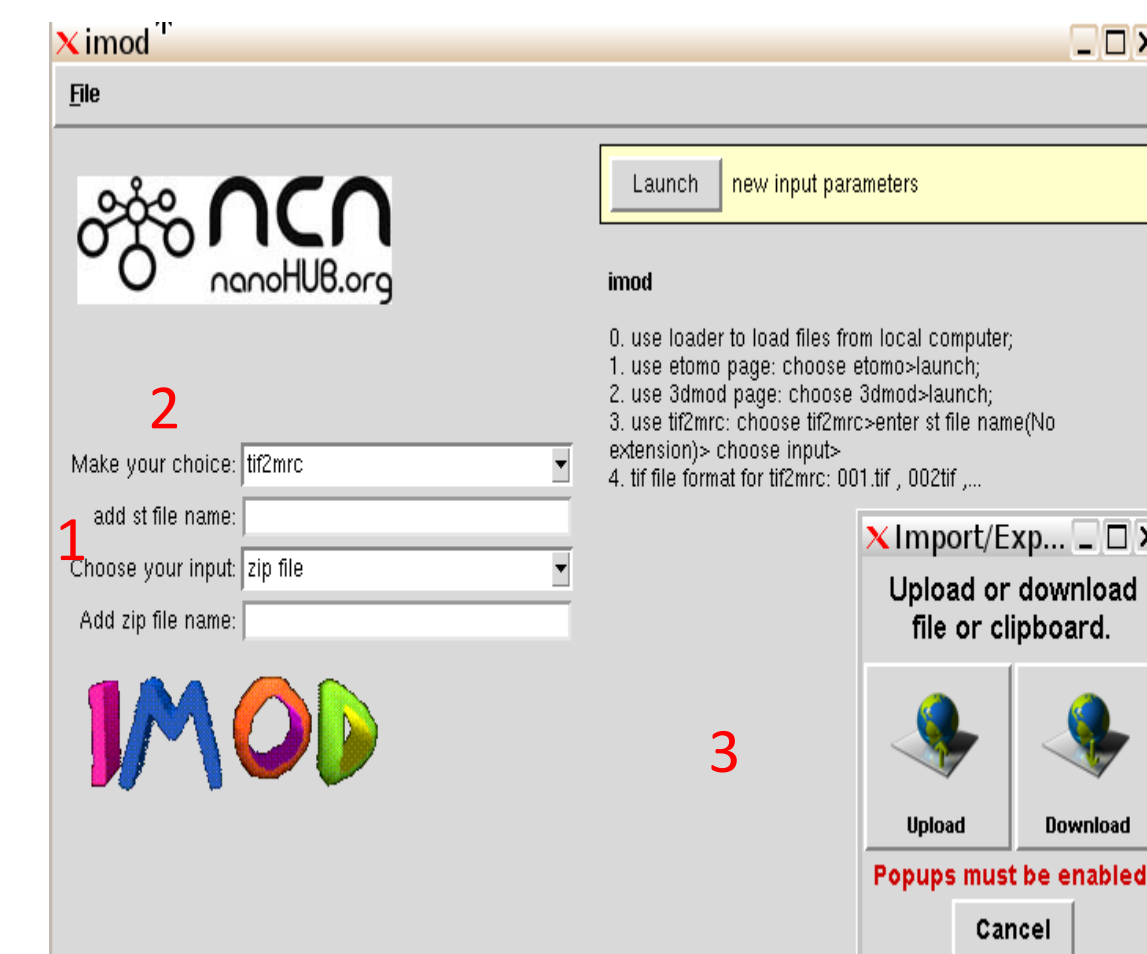
Acknowledgements:

- Hubzero team for training and rapture supporting;
- Hubzero member Steven Clark, Prof.
- Alejandro Strachan, Benjamin P. Haley
- for assistance for the project

Methods:

IMOD Online

The rapture GUI was developed to launch IMOD function windows that have been launched under command line (terminal) interface. Furthermore, image conversion tool (tif2mrc) is enabled under GUI interface. That will automatically convert tiff image files to stack file as soon as the image files are uploaded



IMOD Pop-up GUIs

- Rappture GUI
- 3dmod GUI
- eTomo GUI

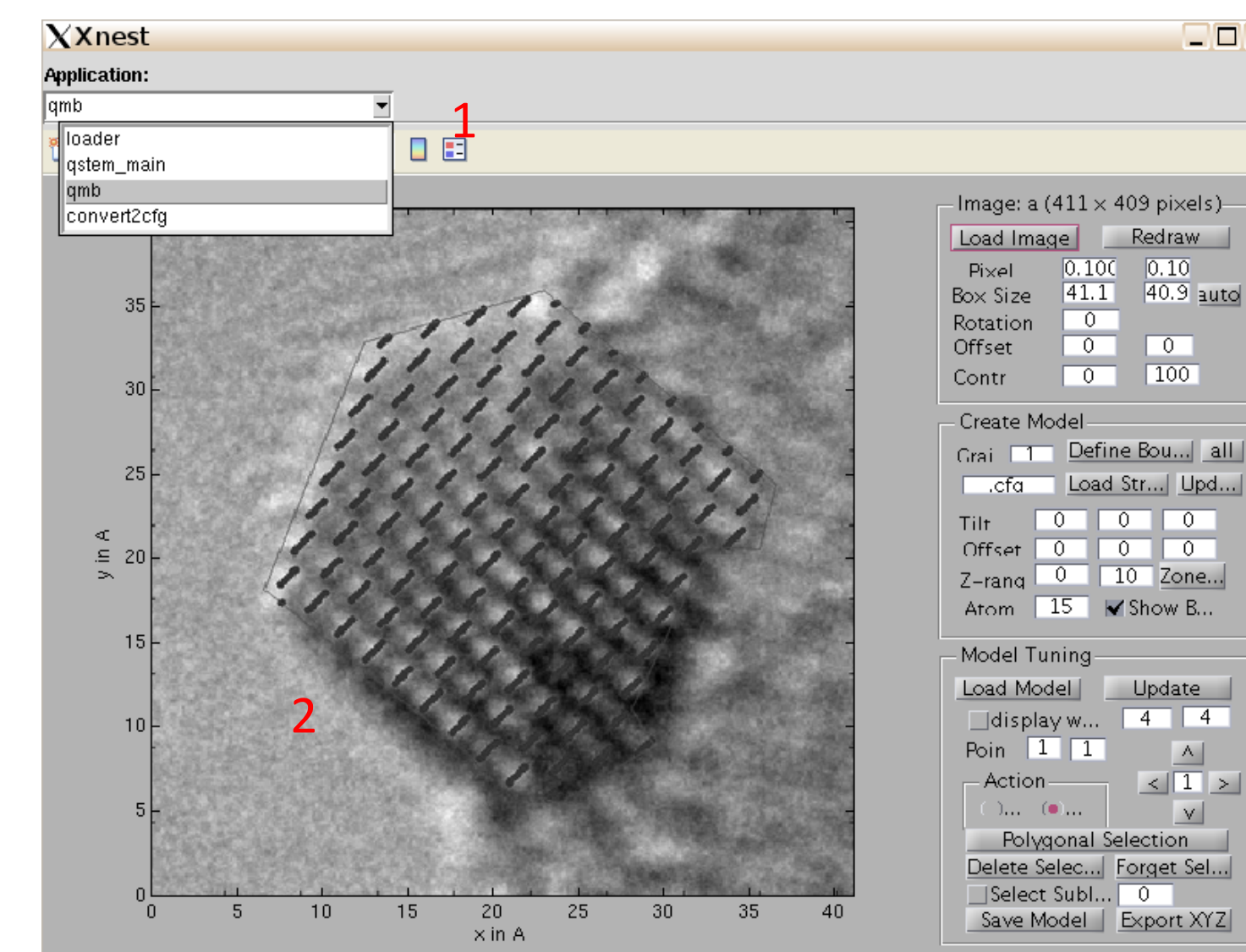
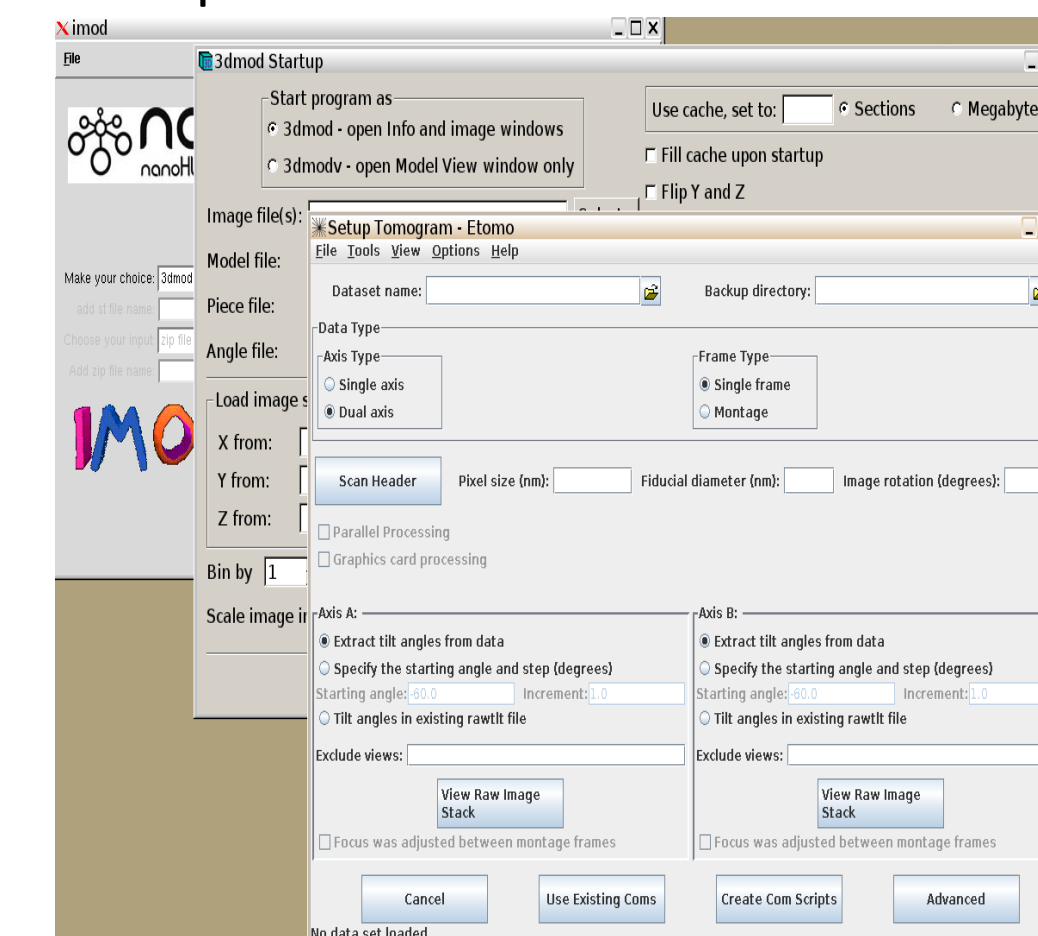


Figure 5: Show the QMB function window of QSTEM online

IMOD Rappture GUI

- Input filename(zip file and st file) when using tif2mrc file conversion;
- Choose to launch IMOD GUIs or call IMOD functions;
- Upload/download file from local computer



QSTEM Online:

To integrate all the functions (small software within QSTEM package) in a single GUI interface, Nanowhim window manager was used.

QSTEM has main page for TEM/STEM simulation, model builder, and file conversion page are enabled via Nanowhim GUI.

- Nanowhim manager: enable users to launch different tools;
- QSTEM Model builder UI

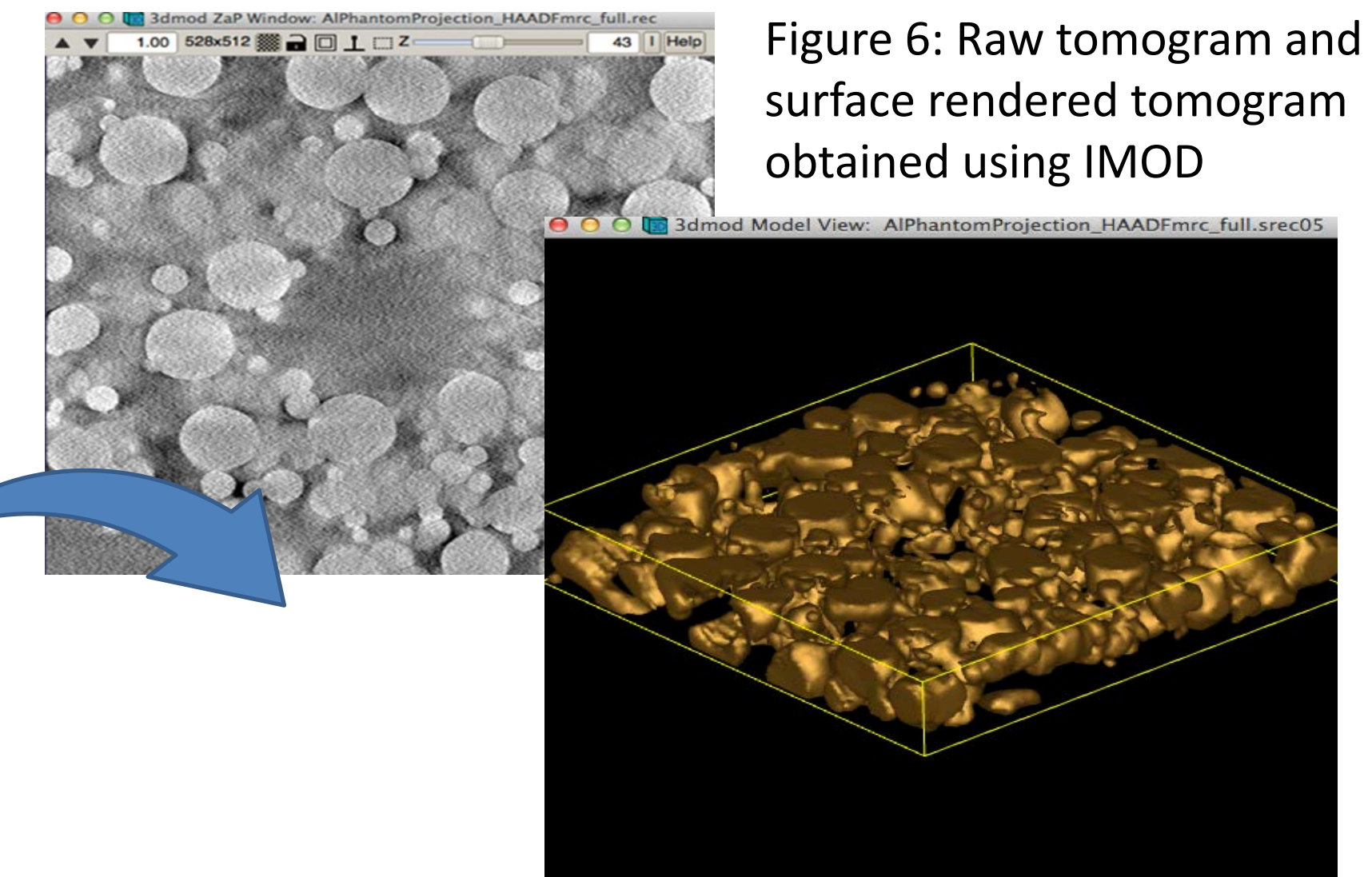


Figure 6: Raw tomogram and surface rendered tomogram obtained using IMOD

Conclusions and Future work:

Online version of IMOD was created to launch the IMOD main page IMOD and eTomo Page.Tif2mrc function was enabled and user can convert TIF files to MRC standard format. Moreover, QSTEM online version was built and users can use convert2cfg function and model builder directly on nanoHUB website.

Some of the future work include:

- Enable more features from IMOD in user interface;
- Launch QSTEM TEM simulation page which has an compatibility issue with nanoHUB system

References:

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