













CTAN / CTVOL Software Package: Getting Started

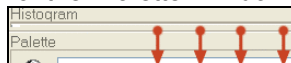
SkyScan, August 2003, Aartselaar, Belgium.



Skyscan's new software package, for image analysis and visualization of the results from micro-CT system scans, contains two programs: **CTan** for 2D visualization and 2D/3D analysis, and **CTvol** for realistic 3D visualization. If the software is supplied as a zip-file, unpack it into any existing or new folder of the local hard-drive. Start CTAn first. To use the two programs together, for direct export of the selected object volume-of-interest (VOI) to 3D-visualization, connect CTvol to CTAn: in CTAn select "File"->"Preferences"->"Tools" and define CTvol.exe as the 3D visualization program.




Open any set of micro-CT results by the  button in the toolbar. The shadow image (if present) and list of files will be shown in the top part of the program window and one of the cross sections in the bottom part. You can animate through the selected dataset levels by pushing  or using the slider on the left side of the files list. Right mouse click in the cross section image to open a submenu for image zoom. Drag and drop the left mouse button in the cross section image or the projection image to measure distances. Different color look-up tables can be selected in the "Palette". Click the  sign to invert the image.


After loading a dataset several buttons will appear in the main toolbar:  : original image view,  : selection of region or volume of interest,  : conversion of images to binary for analysis, and (appearing after conversion to binary)  : image analysis. If you wish to select a region/volume of interest, click the  button and draw with left mouse button held any shape of the region directly on the cross sectional image. This shape can be copied to all cross sections in the dataset by the  toolbar button. To select a 3D volume of interest you can draw different regions in different cross sections, and software will interpolate them automatically through all intermediate cross sections. Use the toolbar button  with pop-down submenu to select regular shapes for the region-of-interest. Volume-of-interest can be limited in the vertical direction by two sliders to the right of the files list. Double-click on the blue bar between these sliders to enter upper and lower limits numerically. One can reset all regions-of-interest by  button to "start again" with VOI selection.

Go to conversion to binary images with the  button. Open the "Histogram" dialog window by dragging down the top border of the "Palette" window by the mouse:










Select the upper and lower global threshold levels by sliders above and under the histogram, or use the  button in the local toolbar for automatic suggestion (finds first value containing voxels). The white part of the binary histogram represents solid objects for the subsequent 2D and 3D analysis. The grey level histogram shown uses the region / volume of interest if selected. This histogram can be saved by the  button.

Use the  button in the main toolbar for image analysis. Distributions of size, perimeter, form, orientation and internal porosity from the current 2D-image are shown as color-coded histograms in the "Analysis" part of the program window. Colors of the histogram's bars match the colors of the objects in the image with corresponding 2D parameter values. To enhance this color coding of the 2D histogram select "color" or "color2" from the "Palette" drop-menu. To see the results from another cross section, select it in the list of available files. Use the local toolbar or right mouse button in the "Analysis" area to start full individual 2D object analysis from the current image ( button) and to start full 3D analysis ( button) from the selected volume of


interest. A further 2D analysis of all selected dataset images is possible by selecting the  button, which will create a tabular comma-delineated text file.

Within the 3D analysis box select the required parameters. A data text report can be saved in either list or tabular (line-by-line) format (comma delineated), the latter suitable for opening by Excel. At the bottom of the box choose either “text file” (standard list report) or “single line of text file” (line-by-line tabular) as formats for auto-saving of analysis results. The tabular format text file allows saving of the results of several analyses adding each time a new line of text.


A report can be printed once 3D analysis is complete. To format the printed report go to “File”->“Print Layout” where you can choose which text and image components to include in the report.


To send the selected volume of interest to CTvol for realistic visualization, go back to the binary images by the  button in the main toolbar (or the tab above the dataset window) and then push the  button in the local toolbar. We recommend that you to select a small volume of interest in the central part of the object for your first visualization attempts, to avoid memory limitation and slow reaction of object movements in 3D-space. Select “Launch associated program to show model” in the “Create 3D Model” dialog for immediate viewing after model creation. CTan will export a 3D-model of the selected part of the object into the **CTvol** program for visualization. The CTvol program starts in a separate window with its own controls as explained below. It can also be started independently. CTvol can show 3D-models from the following files: CTM (from CTan), P3G (from ANT) and STL (from ANT and many other programs). The CTvol toolbar contains buttons to select object movement modes and object(s)/space properties:  : object movement mode,  : camera movement mode,  : show/hide objects(s) properties dialog,  : show/hide stage properties dialog,  : show/hide light properties dialog. Object and camera can be moved by the mouse. By holding the right mouse button one can rotate the object(s) or camera around the object(s) depending on the selected mode in the toolbar. The mouse wheel always changes the distance from camera to object(s) – the directionality of this control can be selected in preferences. The left mouse button can shift object(s) in the case of selection for object movement , or zoom in / zoom out in the case of camera movement being selected. Double click on either mouse button to switch the program between object movement and camera movement modes.

The object properties dialog allows adjustment for the selected object of surface color and other visual properties, and the object can be set as movable/unmovable and visible/invisible. One predefined object – the plate – is generated automatically and can be used to cut the selected object by means of the “cut by plane” button.

The stage properties dialog allows adjustment of the camera viewing angle and selection of background: one specific color, 3D color box or an image box rendered by 6 images from the supplied or user defined files (with selected path+prefix+ “top”, “bottom”, “left”...). It allows also display of the object(s) in stereo mode for red-cyan or red-green glasses (use  in the toolbar for quick ON/OFF stereo) and the adding of fog with adjustable density to the scene.

The light properties dialog allows adjustment of the color and direction of the light for object(s) illumination.

Making movies: The toolbar button  opens the “Flight recorder” window. This option stores a number of scenes (keyframes) with smooth interpolation in between. The resulting movie can be shown directly on the screen and saved to file.

Angular resampling: The toolbar button  allows creation of a new resampled set of cross sections from the original dataset at a different orientation (activated if connection to the original dataset is available). The new set of cross sections will follow the orientation of the cutting plate and will be located symmetrically around it. The number of cross sections and the space between them can be selected in the associated dialog.

The speed of image analysis in CTan and the speed and maximum object size for visualization of 3D-objects in CTvol are determined by the available resources in your computer.