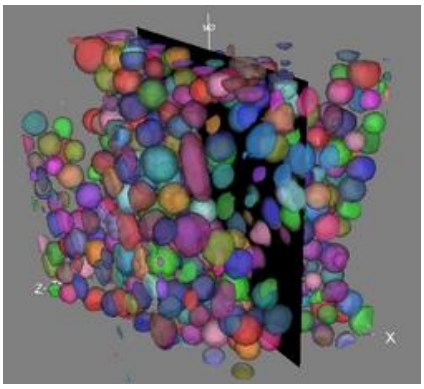
Aphelion 3D Extensions

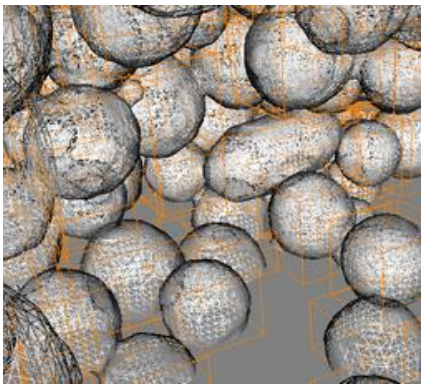
Process 3D images
for a true 3-dimension analysis
and navigate inside 3D objects

Display, Process, and Analyze 3D Images and Point Clouds

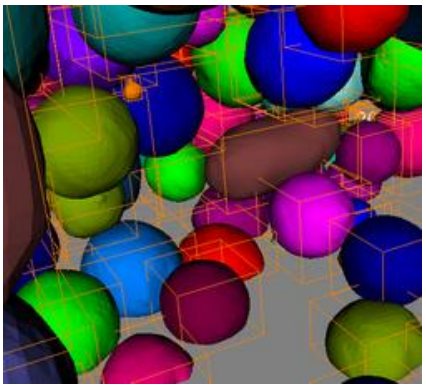
Aphelion™ users can now effectively process and display 3D images using virtually the same processing and analysis power provided for 2D images, point cloud processing, and point cloud<>image conversion. The Aphelion™ Imaging Software Suite includes two optional extensions for these functions: the 3D Image Display Extension and the 3D Processing Extension. Using these powerful extensions, images acquired from sensor devices such as X-ray Micro-CT, Focused Ion Beam, confocal microscopes, medical scanners, Lidar, and other 3D devices, can be easily processed, analyzed, and displayed using the Aphelion™ Dev Graphical User Interface



Extraction of Zirconia grains and visualization using the isosurface rendering mode with individual object coloring



Zoom applied to the image displayed in isosurface rendering mode (wire-frame rendering)



Zoom applied to the image displayed in isosurface rendering mode with individual object coloring

3D Image Display

The 3D Image Display extension, available in the Aphelion Imaging Software Suite environment, adds helpful display tools to analyze 3D structures. The support of GPU acceleration helped to dramatically improve the speed and the quality of the image rendering.

Both a 3D image and the associated Aphelion 3D ObjectSet can be simultaneously displayed in the same Aphelion Visualization window. Different visualization modes are available to let the user accurately analyze any 3D object.

The main features of the 3D Image Display extension are:

- Visualization of both image(s) and Aphelion ObjectSet(s) in the same image window
- Zoom, pan, scroll, and rotation can be synchronized between multiple image windows
- Available rendering image modes: Volume, isosurface, slice
- Available isosurface mode rendering: Surface, Wire Frame, Points
- Full control of the transparency
- Color rendering through color lookup tables
- ObjectSet display with full control of each individual object display including color rendering
- Mouse control of the volume location and orientation
- Possibility to define the center of mass of one single object as the origin of the ObjectSet display

Objects can be individually select by a mouse click on it in the display window or on its row in the grid.

3D Processing

The Aphelion™ 2D image processing operators have been enhanced to handle 3D data including, for example, convolution, addition, subtraction, maximum, erosion, dilation, distance function, labeling, watershed, and threshold. The 3D Processing extension also includes point cloud processing and analysis. A set of specific 3D measurements is available such as sphericity, surface area, and volume.

Operators included in the 3D Processing extension

Images

Arithmetic
Abs
Add
Blend
Divide
Invert
LinearScale
Maximum
Minimum
Multiply
Subtract

Enhancement
EqualizeHistogram

Edge Detection
MorphoGradient
PrewittEdges
SobelEdges
ZeroCrossing

Filtering
Box
Convolve
Gaussian
Median
Mode
RankValue

Frequency Domain
FFT
InverseFFT

Geometry
AffineMap
ExportToSTL
Rotate
Scale
Translate

Input / Output
Import
Read
Write

Logic
And
BitAnd
BitDifference
BitNot
BitOr
Difference
Not
Or
XOr

Matching
Correlate

Math
ACos
ASin
ATan
ComplexFacet
Cos
Exp
Exp10
Log
Log10
Sin
Sqr
Sqrt
Tan

Mathematical Morphology

Basic
Dilate
Erode

Distance
Distance

Enhancement
Contrast
ShadingCorrection

Features
LocalMaxima
LocalMinima
OpenSkeleton
RegionalMaxima
RegionalMinima
UltimateErodedSet
AlternateSequential
Automedian

Geodesy
BorderKill
BorderKillAndHoleFill
Dilate
Distance
HoleFill
Reconstruct

Opening / Closing
AddReconsClose
AreaClose
AreaOpen
Close
DilateReconsClose
ErodeReconsOpen
OpeningClosing.Open
SubtractReconsOpen

Segmentation
BlackTophat
CatchmentBasins
SeededCatchmentBasins
SeededWatershed
SplitConvex
Whatershed
WhiteTophat

Measurements
Area
Compare
Distance
Histogram
Intercepts
LocalMoments
Moments
ObjectCount
Profile
Range
Volume

Segmentation
AdaptivePercentileThreshold
Clusters
EntropyThreshold
ExtractPartition
HierarchicalPartition
HysteresisThreshold
MaximumContrastThreshold
MultiThreshold
OtsuThreshold
RegionGrow
SeededRegionGrow
Threshold

Utility
Clear
Clip
Copy
Fill
Frame
MapThroughLUT
Mask
Paste
SubCopy

Objectsets

Bitmaps

Generation
AdaptivePercentile
Clusters
EntropyThreshold
HysteresisThreshold
Labels
MaximumContrastThreshold
OtsuThreshold
RegionGrow
SeededRegionGrow
Threshold

Morphology
Close
Dilate
Erode
Open

Logic
And
Difference
Or
Overlap
XOr

Input / Output
Read
Write

Filtering
Filter

Geometry
Affinemap
Rotate
Scale
Translate

Measurements
Histogram
Moments
StandardShapeMeasurements
Statistics

Utilities
Append
Copy
Merge
ToImage

PointClouds

Filtering
Crop
SubSample

Generation
CreateMesh
ImageToPointCloud
MeshToPointCloud

Geometry
AffineMap
Rotate
Scale
Translate

Input / Output
Read
Write

Logic
And

Matching
Register

Utility
Copy
CrossSection
Merge
ToRangeImage
ToThreeDImage

Main benefits of Aphelion 3D Extensions

- True 3-Dimension process, analysis, and display
- Fully integrated in the graphical user interface of the Aphelion Imaging Software Suite
- 3 rendering modes to display 3D images, meshes, and ObjectSets (Isosurface, volume, slice) in a single image view
- User-friendly control of the light, the field of view, and the 3D objects
- Support of 64-bit architectures to handle, process, and display very large 3D images