MAVI – MODULAR ALGORITHMS FOR VOLUME IMAGES

3d image processing
- segmentation: interactive, local thresholding, hysteresis
- various filters, morphological and geometric transforms, Fourier transform
- distance and watershed transforms, skeletonization
- fast labeling of objects, object filter
- cell reconstruction, particle separation

3d image analysis
- ObjectFeatures: volume, surface area, number of holes, diameter, shape, ...
- FieldFeatures of microstructure components: volume fractions, densities of surface area, Euler number or fiber length, fractal dimension, mean chord length, ...
- OpenFoamFeatures: mean cell size and strut thickness, ppi-value
- geometric tortuosity
- spectral analysis: power spectrum, covariance, Bartlett spectrum
- SubfieldFeatures: local analysis of microstructure components
- SubfieldFiberDirections: local fiber direction analysis - degree of anisotropy, principal direction, orientation tensors
- spherical granulometry: local size and thickness distributions

3d image visualization
- slice view, volume rendering

Data import and export
- native image format as well as 2d image stacks, raw volumes, AVS field data, various other volume data types
- export of analysis results as CSV files

2d images
- supported by most algorithms

Optimal system
- operating system
  - Windows 64 Bit or SuSE Linux 64 Bit
  - further OS on request
- hardware
  - 8GB RAM and 500GB disc space or more, depending on volumes to be processed
  - Intel Xeon or AMD Opteron processor
  - recent high-end Nvidia OpenGL graphics board
  - monitor resolution at least 1280x1024

License and support
- single user floating license
- update/service contract
- on-site software training and consulting
- customized software development
Analysis of Microstructures

Microstructures

MAVI is not restricted to a certain range of materials. So far, 3d images of the microstructure of the following materials have been investigated using MAVI:

- metals, ceramics
- sinter materials
- composites
- fiber reinforced polymers
- metal, ceramic, and polymer foams
- non-wovens, felts, paper
- building materials, e.g. concrete or cement
- sandstone, soil, snow
- biological materials, medical objects, food

Image data

- micro computed tomography
-Fill tomography
- electron tomography
- serial sectioning
- confocal laser scanning microscopy

MAVIlib

The wealth of algorithms used by MAVI is available as a C++-library, too. MAVIlib is complemented by MAVImini offering slice view, interactive cropping and thresholding only.

MAVImesh

This latest addition to the MAVI family bridges the gap between your tomographic image data and your simulation framework. MAVI mesh generates a triangular meshing of the surface of the foreground component, allows to simplify the mesh to a user defined degree and exports the mesh in STL format.

Service

We provide service analyses as well. If you are interested in an analysis and do not have equipment for acquiring 3d images, we will help you with image acquisition.

- X-ray micro-CT
- sample preparation
- image processing and analysis
- fixed prices

For further information on our service offer, please refer to our separate brochure "3d-Microtomography".

Examples: Volume renderings of reconstructed tomographic images along with selected analysis results. All images taken by ITWM’s in house CT.

1. Open nickel-chrome foam
Sample: Recemat International (RCM-NCT/23.13); Result of distance transform. Blue – strut system, from green to red – increasing distance to strut system. Reconstructed cells (colored, each color represents one cell). Histogram of cell volumes.

2. Sugar
Particle size histogram – diameters of the equal volume ball; Particles separated using distance and watershed transforms.

3. Part made of glass fiber reinforced polymer
SubfieldFiberDirections – colors of tiles represent deviation of principal direction in the 3d tile from principal direction in the whole part

4. Silica gel fibers
Sample: Fraunhofer ISE; SubfieldFiberDirections – colors of fibers represent their local directions in the colored pixels.