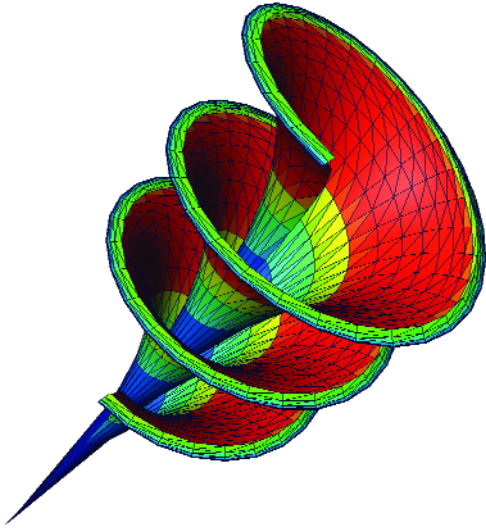




**ADVANCED VISUALIZATION
DATA ANALYSIS
GEOMETRY RECONSTRUCTION**

**CAD/CAM/CAE
ENGINEERING
GEOSCIENCE**



Dini Equation - Color-coded visualization of a parametric surface generated with a custom script object.



The amira® software offers fascinating new opportunities to all users working with three-dimensional data.

With unmatched interactive speed and visual quality, amira allows the user to explore complex 3D data such as scalar and vector fields, polygon and finite element models, scattered data, and much more.

Advanced visualization techniques such as efficient polygon viewing, iso-surfacing, oblique slicing and clipping, pseudo-coloring, direct volume rendering, flow visualization, and many more powerful modules are ready at your fingertips to unleash the full potential of your 3D data. By exploiting the latest graphics hardware, amira can display even very large datasets at interactive speed.

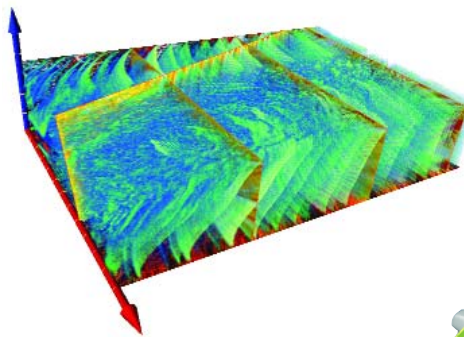
In addition, amira comes with numerous tools for data analysis. You can easily probe data, measure distances, regions, and volumes, and perform statistical analysis on multiple regions of interest.

amira provides the complete set of powerful tools for generation and post-processing of accurate 3D polygon models as well as finite element meshes for simulation, engineering, planning, and teaching.

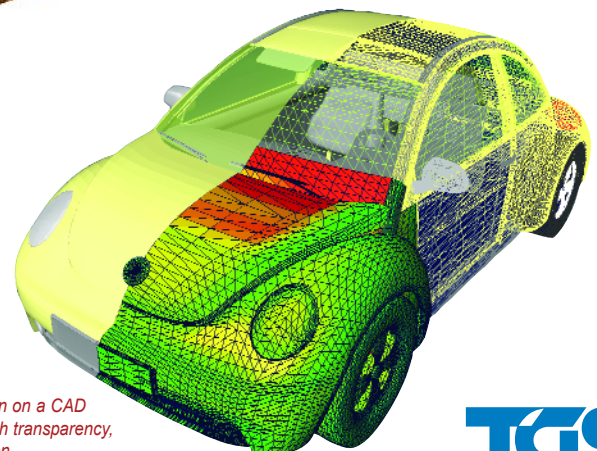
Furthermore, amira offers excellent presentation support. You can easily create snapshots, export movie files, and create truly three-dimensional presentations by exploiting advanced stereoscopic display technology.

All this functionality is available through amira's user-friendly interface, offering efficiency and ease-of-use to researchers, students, and all professionals working with 3D data.

- **Fast and accurate 3D visualization**
- **Measure, analyze, and probe your data**
- **Easy to learn, easy to use graphical interface**
- **Full control over the application through built-in scripting interface**
- **Create spectacular presentations by exporting movie files and high-resolution images**
- **Allows the flexibility of working with any platform from PCs to high-end graphics workstations and VR systems**
- **Extensible: write your own modules and I/O routines using amiraDev™**
- **Extensible display environments**

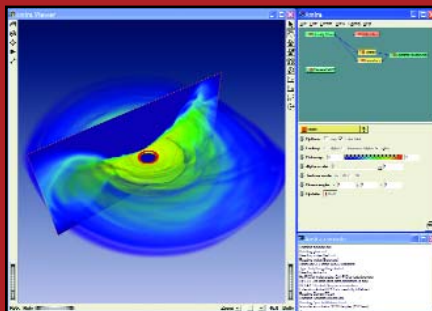


Slicing and direct volume rendering of a processed seismic dataset. This kind of survey is typically done by placing a series of geophones, using a high-intensity sound source, and recording the reflections collected by the geophones. Courtesy of Landmark Graphics Corp.

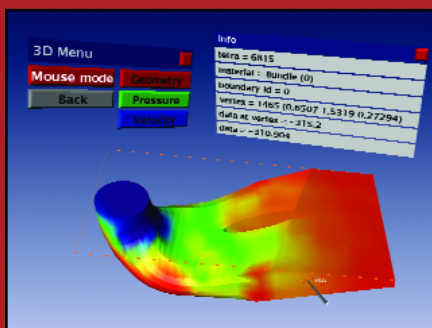


Mix of different visualization on a CAD model: wireframe, solid with transparency, and scalar field visualization. CAD data courtesy of Volkswagen AG

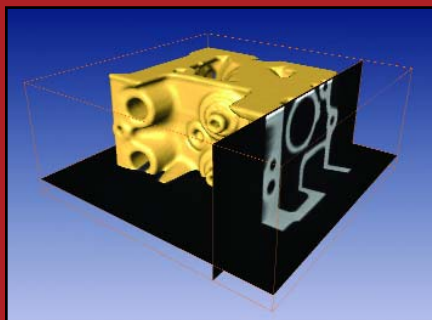
Key Features



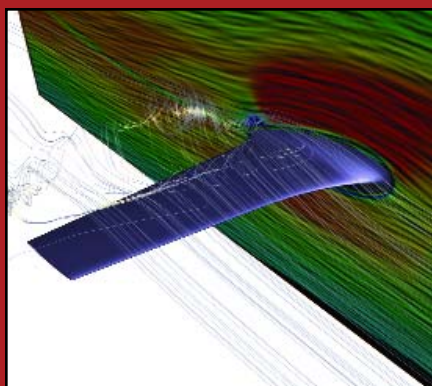
Astrophysics: simulation of a black hole.
Data courtesy of John Blondin, University of North Carolina



Turbine visualization and real time probing using amiraVR extension. Visualization of pressure, viscosity and turbulence datasets.
Data courtesy of EDF Research Center



Industrial tomography: part of a motor block is being examined by CT scanning. Visualization by iso-surfacing, orthographic slicing, and clipping.



Wing air flow simulation with colored texture (line integral convolution) and animated illuminated stream lines.

Data Import

Load your data directly into amira. A large number of standard file formats are supported. (See complete list on pg. 4)

- Polygon models and finite element data
- Scalar and vector fields
- Scattered data formats
- 2D image data and stacked image data
- Easily add new file formats and data types using amiraDev

Slicing & Clipping

Quickly explore your 3D imagery looking at single or multiple orthographic or oblique sections. Clip away parts of your data in order to uncover hidden regions.

- Rapid and accurate orthogonal and oblique sections
- Semi-transparent slice display
- Pseudo-coloring for overlaying sections with functional data
- Display of iso-intensity lines
- Interactive clipping planes

Data Manipulation and Filtering

Simple and efficient 3D image manipulation is possible through a variety of digital filters, editors, and data processing modules.

- Filters: median, unsharp masking, histogram equalization, Laplace, Gauss, Lanczos, Sobel, and more
- Interactive crop editor
- 3D image stitching
- Resampling and resolution control
- Arbitrary arithmetic operations
- Arbitrary contrast and color mapping, many predefined color schemes

Surface Rendering

Display and explore detailed 3D surface models. A multitude of drawing styles and color schemes help to yield even more meaningful and informative visualizations.

- Rapid iso-surface generation
- Robust and detail-preserving reconstruction of surface models from segmented image data
- Import of polygon models
- Physically-based rendering of semi-transparent models
- Wire-frame display
- Pseudo coloring on the surface (e.g. functional data)
- Display of partial surfaces
- Powerful multi-style rendering

Volume Rendering

Volume rendering allows a direct visualization of 3D image data using a physically based light emission/absorption model.

- Interactive manipulation of transfer function (color + transparency mapping)
- Intuitive volume editing by drawing in the viewer
- Arbitrary compositing of semi-transparent volumes with other types of visualization
- Resolution control and region of interest
- Maximum intensity projection
- Advanced support for VolumePro® 500/1000 boards

Image Segmentation

Segmentation assigns labels to individual pixels in the image data in order to identify and distinguish different materials or structures. Segmentation is the prerequisite for accurate 3D model generation as well as for advanced data analysis tasks.

- Automatic threshold segmentation
- Powerful segmentation editor for interactive labeling of structures
- Brush tool (painting)
- Lasso tool (contouring, intelligent scissors)
- Magic wand (region growing)
- Contour fitting (snakes)
- Rapid processing of large datasets by Interpolation between key slices
- 3D wrapping tool for organic shape interpolation from very few orthogonal slices
- Specific segmentation filters, including island removal, smoothing, interpolation
- Both 2D (slice by slice) and 3D segmentation operations
- 4-viewer mode with crosshair

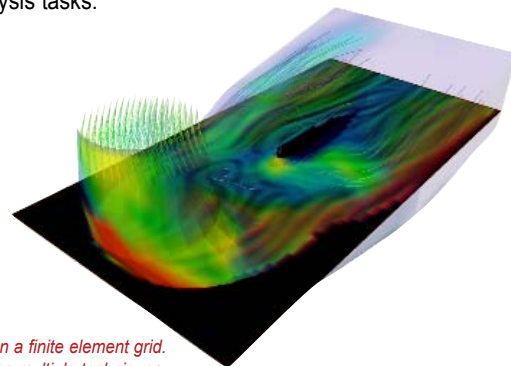
Viewing & Navigation

Display single or multiple datasets in a single or multiple viewer windows, and navigate freely around or through these objects.

- Multiple independent or synchronized viewer windows
- Arbitrary view points inside or outside the object
- Support for stereoscopic viewing
- Restrict data display to user-defined region of interest (ROI)
- Intuitive transform editor
- Arbitrary combination of different visualizations in the same 3D view

Data Analysis

Probing, measuring, counting and other statistical modules allow to quantify densities, distances, areas, volumes, and much more.



Flow inside a turbine simulated on a finite element grid.
The visualization combines multiple techniques, including pseudo coloring and stream lines.

- Histogram analysis
- Probing of data values in a point/sphere, or along a line/curve
- Measurement of angles, distances, areas, volumes
- Counting of connected components
- Statistics output for each material and per connected component
- Compute Hausdorff distance between two surfaces
- Curvature analysis on a surface
- Correlation analysis tools
- Spreadsheet output

Advanced Polygonal Models

Polygon post-processing tools generate compact surface models of the highest possible quality, which is important for efficient processing and accurate data analysis.

- Generate smooth and consistent surfaces
- Model simplification: intersection-free polygon decimation
- Flexible grouping of sub-structures and material types
- Surface smoothing
- Surface editing
- Mesh quality analysis

Time-Dependent Data

Besides single time steps, time series of data can be processed interactively.

- Direct import of data time series
- Jump to individual time steps or play/swing/loop through sequence
- Smooth interpolation between the original time steps

Large Data

Even very large datasets can be processed within amira at interactive speed.

- Fast interactive OpenGL rendering exploiting latest graphics hardware
- Import of down-sampled or partial data from large disk datasets to allow for out-of-core processing
- Quick and easy access to a region of interest (ROI) in very large datasets

Registration, Fusion, Alignment

Align and register multiple datasets for comparison, referencing, or fusion. Fuse multi-modal data to increase the amount of information and accuracy in your models.

- Align principal axes of multiple objects
- Align surfaces with or without specifying corresponding points
- Smooth interpolation between two corresponding surfaces (morphing)
- Fusion of multi-modal data by arbitrary arithmetic operations

Grid Generation for Finite Element Simulation

Finite element grids are a prerequisite for tasks such as mechanics and deformation simulation, computational fluid dynamics, and rapid prototyping.

- Generate high-quality tetrahedral grids
- Direct visualization of functional data (scalars, vectors) on the grid
- Fast arbitrary sections and boundary visualization
- Flexible import/export of grids and simulation data
- Easy integration and control of external simulation software through amira script objects or custom amiraDev modules

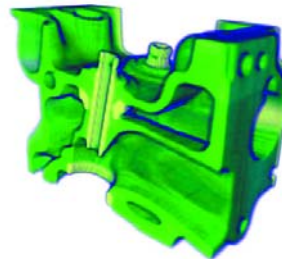
Flow Data

Advanced vector field visualization allows to display the results of flow simulation or measurement within the 3D model.

- Interactive vector arrow display
- Illuminated stream lines
- Stream ribbons
- Colorized flow textures (*FastLIC*)
- 3D stream surfaces
- Easy integration with all other types of data and visualization

Point Clouds/Scattered Data

Process arbitrary functional data given on a set of 3D points, e.g. coming from laser scanning.



Industrial tomography: direct volume rendering of a motor block acquired using a CT scanner

- Efficient display as colored points or spheres
- Semi-transparent point display
- Arithmetic filter expressions to select point subsets
- Point set selection by perspective drawing in the viewer window
- Analysis and extraction of corresponding points in two clusters (e.g. in two time steps)
- Re-sampling of scattered data into a uniform grid

Presentation

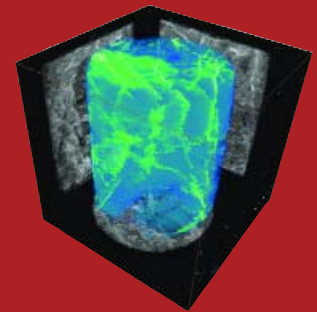
Present the results of your work in the best possible quality and in every state-of-the-art digital medium.

- High-resolution tiled or off-screen rendering for print-quality images
- Alpha channel output for seamless integration of images in other presentation material
- Direct movie file export
- User-defined camera rotations and arbitrary camera paths
- User-defined animation of visualization parameters

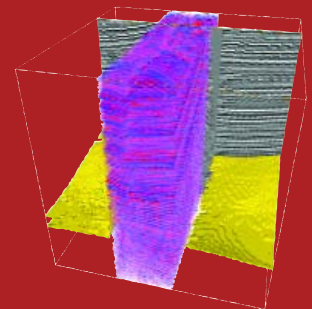
Scripting

Scripting provides an easy and flexible way of customizing amira and automate tasks without the need for C++ programming.

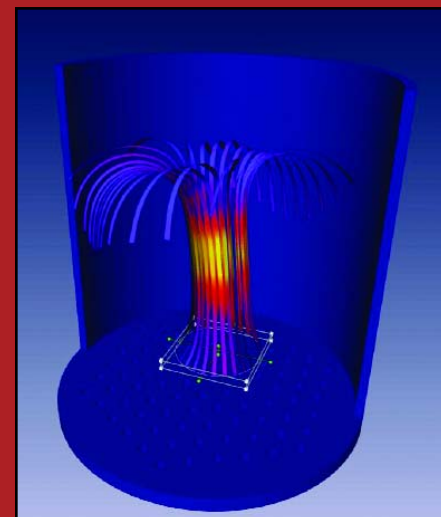
- Full control over all modules and viewers through Tcl script interface
- Easy definition of script objects with their own graphical user interface
- Streamlining and customization of routine tasks
- Automation experimental series
- Integration and control of external software packages



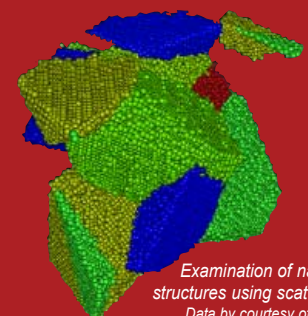
Terrain carrot: volume rendering with projection views. Volume rendering is used to highlight the water channel
Data courtesy of ENI - Agip



Processed seismic dataset (slicing and direct volume rendering)
Courtesy of Landmark Graphics Corp



Stream ribbons visualizing the fluid flow in a bubble cap reactor
Data courtesy of Biofluidmechanics Lab, Charité Berlin (Axel Seeger).



Examination of nano-crystal structures using scattered data.
Data by courtesy of Helena van Swygenhoven, Paul-Scherrer Institute (PSI), Villigen, Switzerland.

Supported Platforms

- Microsoft Windows 98/ME/NT4/2000/XP
- SGI Irix 6.5.x
- HP-UX 11.0
- Sun Solaris 8
- Linux RedHat 8.0

amira requires a graphics board with OpenGL acceleration and texture mapping capabilities.

Data File Formats

Geometry file formats:

Altair Hypermesh (r/w), AmiraMesh (r/w), AmiraMesh LDD (r/w), AVS Field (r/w), AVS UCD (r/w), binary raw data (r/w), DXF (r/w), FIDAP NEUTRAL (r), Fluent/UNS (r/w), HxSurface (r/w), IDEAS universal (r/w), OpenInventor .iv (r/w), Plot 3D single structured (r/w), STL (r/w), VRML (r/w).

Optional geometry file formats:

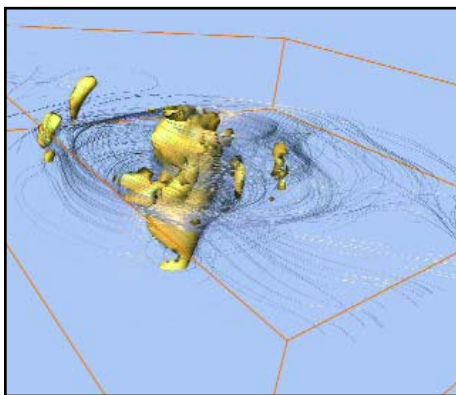
Support for other file formats are available upon request, e.g. Radioss from Mecalog, Madymo from TNO Automotive

Image file formats:

ACR-NEMA (r), Analyze 7.5 (r), AnalyzeAVW (r), BMP (r/w), binary raw data (r/w), Bio-Rad Confocal (r), Encapsulated Postscript EPS (w), DICOM (r/w), Icol Colormap (r/w), JPEG (r/w), Leica 3D TIFF (r), Leica experiments .lei (r), Leica Slice Series info (r), Metamorph STK (r), PNG (r/w), PPM/PGM/PNM (r/w), PSI (r/w), PLY (r/w), SGI RGB (r/w), Stacked Slices (r), TIFF (r/w), Zeiss .ism (r).

Additional file formats supported by the amiraMol extension:

MDL (r/w), Protein Database PDB (r/w), PSF/DCD CHARMM (r), Tripos (r/w), UniChem (r/w), ZIB Molecular File Format ZMF (r/w).



Weather Data Visualization - Streamlines initiated in high potential vorticity region of a hurricane, along with isosurface of potential vorticity.

*Created by Gordon Erlebacher (CSIT).
Data courtesy of Xiaolei Zou (Meteorology).*

Other amira components:

amiraDev™

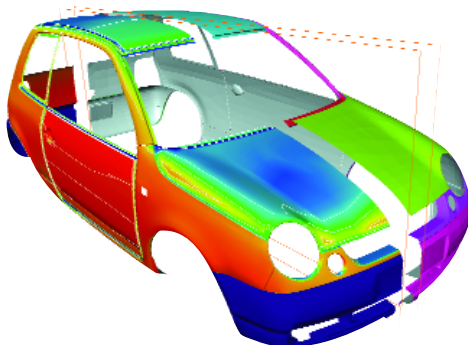
This developer's edition of amira allows you to extend the base amira application by adding custom data types, visualization or processing modules, and input/output routines through a well-documented C++ API. The object-oriented and open design of amira as well as the consequent use of powerful standard software layers such as OpenGL™, Open Inventor™, and Qt™ make amiraDev the ideal development and research platform for 3D data processing and visualization tasks.

amiraVR™

This version of amira brings the power of the base application's advanced visualization capabilities to virtual reality. amiraVR features include head-tracking, support for tracked input devices as well as multiple video output channels and multiple graphics pipes, multi-threaded rendering, multi-wall support (e.g. for CAVE® or Holobench® systems), integration of user interface components into the virtual 3D scene, support for active and passive stereoscopic displays, software soft edge blending, and much more.

amiraMol™

This amira extension adds support for import of static and dynamic molecular data, e.g. PDB, and powerful methods for visualization, selection, and editing of molecules. By combining these tools with the capabilities of the amira base system (e.g. volume rendering or vector field visualization), amira + amiraMol is an outstanding platform for researchers in chemistry, bio-chemistry and the pharmaceutical industry.



Visual quality check of car coat thickness for optimization of the coating process.

Image courtesy of Inpro GmbH / Dupont Automotive Coatings GmbH. CAD data courtesy of Volkswagen AG.

About amira®

amira is a 3D visualization and modeling system originally developed at the Department for Scientific Visualization of ZIB (Zuse Institute Berlin, Germany). Indeed - Visual Concepts GmbH, a spin-off from ZIB, continued to develop and maintain the product, based on the Open Inventor toolkit from TGS. In 1999 Indeed and TGS entered into a partnership that made TGS the exclusive world-wide distributor for amira. Since then the two companies have worked together to make amira one of the most efficient and best-selling visualization solutions in the world.

TGS Corporate Background

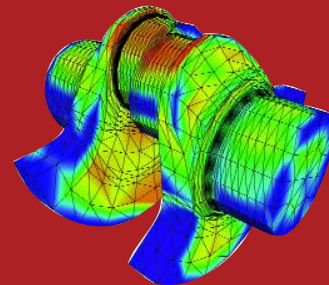
For over 20 years, TGS has been providing open systems-based 3D graphics software tools for application developers and end users.

TGS offers standards-based cross-platform graphics and is the leading independent software supplier of graphics software tools and utilities.

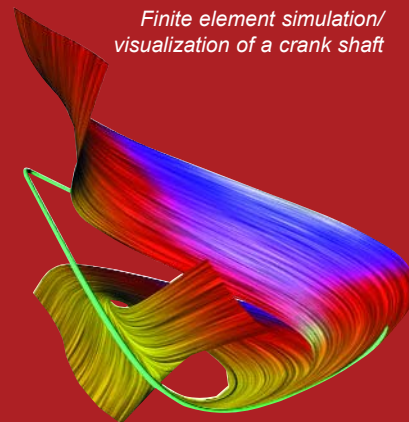
Technical Information

More information and additional resources are available on the web at www.tgs.com.

Look up frequently asked questions, application examples, customer spotlights, technical papers, and much more.



Finite element simulation/ visualization of a crank shaft



Visualizing differential equations: a dynamical system with a limit cycle (Brusselator).

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