

Amira 5.3

Advanced Visualization and Data Analysis

Release Notes
Version 5.3.0

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Dear Customer: This document describes new features, modules and changes in version 5.3 of the Amira visualization and data analysis program. Please carefully read these Release Notes which are part of the Amira 5.3 user documentation.

Different from previous versions of Amira, the Release Notes 5.3.0 will not contain those of earlier versions. If you are interested in those older versions please visit <http://www.amira.com/documentation/>.

We would appreciate your feedback regarding this software version. If you have any further suggestions or proposals for future improvements, please contact the Amira support hotline at amirasupport@visageimaging.com.

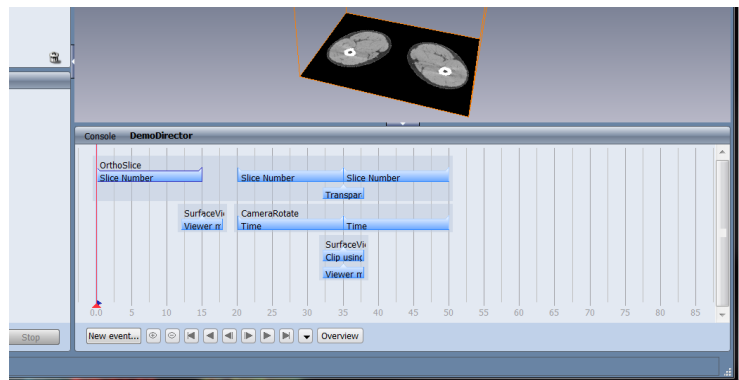
Thank you again for the confidence you have placed in us. We wish you every success with your Amira 5.3.

Visage Imaging, June 2010

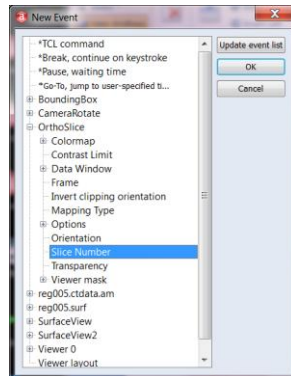
Changes and new features for basic Amira

DemoDirector

This new feature has been created as the graphical front-end for the familiar *DemoMaker* module. It facilitates creating animations and demos by providing a timeline window that allows placing and manipulating events in an intuitive manner. The timeline window can be launched from the **Console** window title bar whenever a *DemoMaker* module has been created. New events are now more easily created from a dialog where all **Pool** modules are listed in a tree list. The available ports of each module will be shown when the list of module entries is expanded.



Timeline window of the *DemoDirector* is a tab in the **Console** panel.



New Event dialog of the *DemoDirector* with all **Pool** modules listed in a tree list.

Spreadsheet redesign and enhancements

Amira's *SpreadSheet* object has been largely reworked. It includes the following new features and more:

The viewer (button *Show* in the **Properties** of the *SpreadSheet* object) now shows up as a convenient table widget supporting copy and paste as well as sorting rows according to columns.

Spreadsheet objects may contain more than one table.

Spreadsheets can now be saved in MS Open XML format, which supports direct exchange with MS Excel and other compatible spreadsheet calculator applications.

A new functionality in *SpreadSheet* objects can be used to

highlight items marked in the spreadsheet.

SpatialGraphStatistics is one of the modules that use this new functionality. When module *SpatialGraphView* is connected to *SpatialGraphStatistics*, highlighted rows in the spreadsheet will be highlighted in the *SpatialGraphView*.

New Modules

PlotSpreadSheet Plots spreadsheet contents in a curve.

SpreadSheetFilter Exports rows according to a user-defined range of column values.

SpreadSheetToCluster Converts a spreadsheet with x, y, and z coordinate columns into a cluster object.

SurfacePaths/SurfacePath Editor With SurfacePaths a new type of data object storing lines defined on triangulated surface meshes is introduced. The data objects and their dedicated editor, the *SurfacePath Editor*, can be used to measure distances on surfaces. The editor automatically computes shortest paths on a continuous surface but can also be restricted to existing edges of the triangulated surface.

ComputeDistanceToPoint For *SpatialGraph* objects, this module computes the shortest distance from a user-specified point to all other points on the graph and stores it as a point attribute.

LabelSpatialGraph Labels a *SpatialGraph* object at points or nodes according to a spatially coincident LabelField.

SplitVolume converts a mosaic image into an image stack. For example, a mosaic DICOM image as created by certain DICOM scanners. The module can also be used to split a time series contained in a single volume into its time steps.

ConnectedComponents has been improved to support short (16-bit signed or unsigned numbers) and integer (32-bit signed) fields. Also, a dedicated mode for analyzing connected regions in label fields has been added. If a label image is requested for output, the user can specify the output type as a regular LabelField, unsigned short (16 bit) or unsigned integer (32 bit), depending on the number of unique labels.

SurfaceThickness This module is useful for computing the thickness of flat regions from surface objects. To do so, at each vertex, the module computes the distance along the vertex normal to the normal's intersection with the closest triangle of the same material. To get a reasonably reliable thickness estimate the surface should be smooth and opposing triangles should be approximately parallel.

AverageVolumes A module that allows computing the average and/or standard deviation of several uniform scalar fields or label fields with optional transformation set for each field. The calculation is performed out-of-core so that the input data need not reside in memory during processing.

CannyEdgeDetector A new compute module that implements an image filter for edge detection. This filter produces a binary image where edges are represented as foreground voxels.

Updated Modules

ClusterView has a new option to scale size of the spheres based on the data values attached to the cluster vertices (check option *plates* and *scale plates*).

BoundingBox has new ports to specify the color and width of the lines drawn and to enable additional lines indicating the center of the bounding box.

New Neuro Option

A new option dedicated to users in brain research has been created. The option features a comprehensive set of modules to analyze and display diffusion weighted MR imaging results. Another set of modules is dedicated to the analysis of perfusion weighted CT and MR images.

A separate license (AmiraNeuro) is required. Please contact amirasales@visageimaging.com for pricing information.

Modules

ComputeTensor Computes a second-order tensor from diffusion weighted images.

ComputeTensorOutOfCore Computes a tensor from diffusion weighted images residing on hard disk.

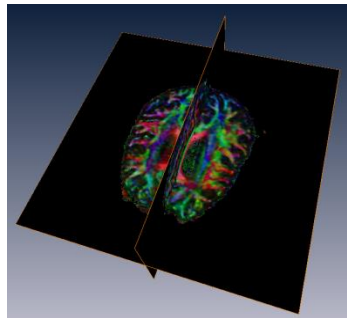
CreateGradientImage Creates a gradient image from a given tensor field.

EigenvectorToColor Generates a directionally encoded color (DEC) image from the eigenvectors of a tensor field.

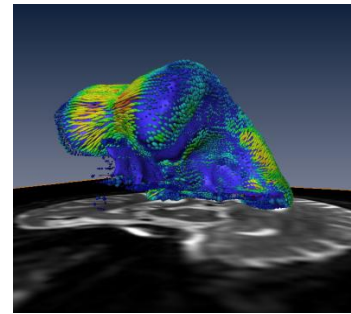
FiberTracking Generates fiber lines from seed regions inside the tensor field to detect potential fiber tracts from diffusion weighted MR images.

ComputePerfusion Computes the perfusion related measures mean transit time (MTT), blood flow (CBF), and blood volume (CBV) from a perfusion weighted image series (MR or CT).

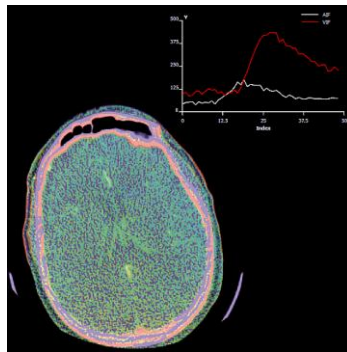
ExtractEigenvalues Compute the eigenvalue decomposition of a connected tensor field.



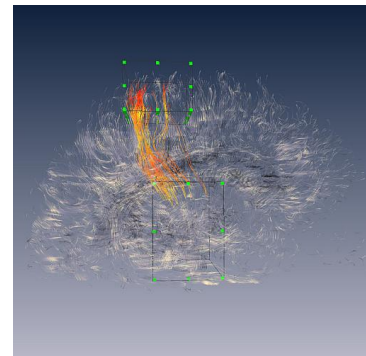
Directionally encoded color (DEC) image of a DTI image series.



Surface tensor display of a DTI image series.



False color display of CBF computed from perfusion weighted CT time series together with a plot of venal input function (VIF) and arterial input function (AIF).



Extracted putative fiber tracts computed from a DTI image series. Using module *SelectLines* it is possible to retrieve a subset of lines with user-defined source and destination regions.

Changes and new features in Amira Developer Option

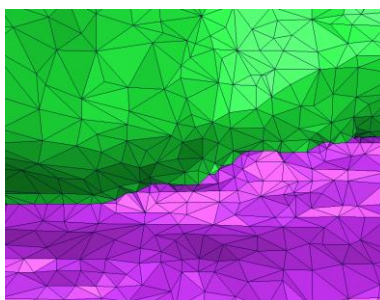
ITK integration Users of the Developer Option can now use the ITK (*Insight Tool Kit*) library to integrate existing ITK code or to create new code that uses the ITK library. For getting started with the ITK engine the Development Wizard now offers an example ITK filter project.

On 64-bit Windows Amira now supports Visual Studio 2008 (Visual C++ 9.0)

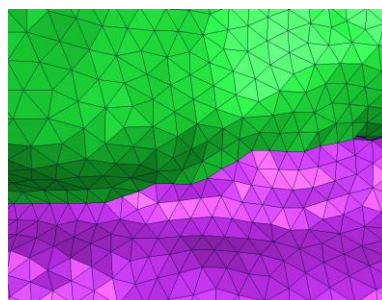
A class reference has been added. It can be accessed by opening `<Amira-Install-Dir>/share/devref/Amira/index.html` in a web browser.

Changes and new features in the Mesh Option

RemeshSurface The new *RemeshSurface* module may be used to improve triangle quality of triangulated surface meshes. The module takes a surface object as input and re-meshes it by moving the vertices to meet certain regularity criteria. Besides number of triangles, re-meshing objectives are either *high regularity* or *isotropic vertex placement*.



Surface decimated using the Simplification Editor



Surface decimated using module *RemeshSurface*

New File Format

Abaqus (.inp format) Tetrahedral grids can now be exported for SIMULIA's Abaqus program (www.simulia.com). Along with the tetrahedra, optional scalar values defined on the tetras can be exported.

Changes and new features in the Microscopy Option

Filament Editor

The Filament Editor has been significantly improved by adding new tracing options and editing tools. The most important changes are listed below:

View options tab:

SpatialGraphView group has a slider to control line width in the 3D viewer.

Node size and line width can now be controlled in the tracing window.

Tools options tab:

Graph Info now generates tables with label group statistics. For each label group a tabbed table is inserted listing all segments associated with a particular label. Note that buttons *Export to XML* and *Graph summary* have been removed in order to unify the window layout with the new spreadsheet design. Exporting to XML can be performed using the regular *Save data as...* dialog. A graph summary can be achieved with appropriate labeling. Also, *Rank* is now considered a regular segment attribute and will have a column in the table only if the attribute exists.

New tool *Remove isolated points* removes points or nodes with no adjacent segments.

A new tracing method *Linear* lets the user trace straight lines.

In port *Filament type* the user can now specify whether the filaments are represented as bright against a dark background or as dark against a bright background (applies to interactive tracing only).

New option *Snap to Graph*: When commencing a new tracing line with one of the interactive tools previously there was a tolerance of 5 pixels within which the generation of a new branching node on an existing segment was enforced. Now this snap mechanism can be disabled.

Editing tools

New tool *Select sub-graph* selects the sub-graph downstream from a selected node or segment. Clicking with the SHIFT key pressed selects the upstream sub-graph (in direction of root segment). This tool is available only if a root segment/node has been set with *Set Root* button.

New tool *Select shortest path* which calculates the shortest path between an arbitrary pair of nodes or segments.

New tool *Move selected node* lets you move a node in the tracing window.

All graph editing tools are now equipped with modifier keys to make working more efficient. A table of all modifier keys and their function is given in the User's Guide.

Viewer

The 3D slice now draws a yellow frame of exactly the size of the field of view currently visible in the tracing window

Label Editor

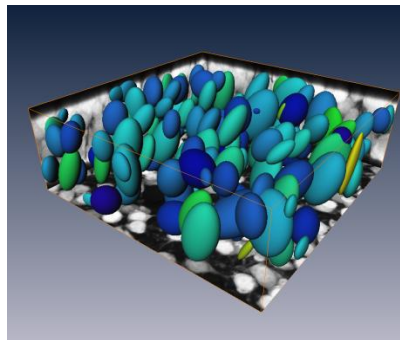
The sequence of labels can be changed by dragging labels up and down in the label list. Complete label sub-trees can be moved into other label groups.

New Modules

ShapeAnalysis Analyzes regions in a label field with respect to their shape by approximating an ellipsoid to each label. The parameters of the ellipsoids as well as position and volume are output in a SpreadSheet object.

MorphologicSeparation This module attempts to separate similarly sized objects that touch each other. The input to the module is a label field. Objects are identified by their connectivity and their label number. The objects are separated based on their morphology.

LocalThreshold Is a module to perform threshold segmentation according to local criteria. The module is useful whenever low frequency gradients prohibit the use of global thresholds. Four different approaches cited in the literature have been implemented.



Visualization of the output of **ShapeAnalysis** using *TensorDisplay*.

WatershedSegmentation A module that uses the ITK implementation of the *Watershed Transform* to segment gray value images into meaningful regions.

Further improvements and changes

Modules

CreateSphere was available in the Molecular Option only. This has been changed so that all Amira customers may use it.

TridalityView The module to drive Tridality's MultiView Autostereo displays is now also available on 64-bit Linux and Mac OS X.

CalculusMatlab The connection to the Matlab server has been improved. The module can now transfer surfaces, surface fields, and line sets from Amira to Matlab. Also, *CalculusMatlab* can now be accessed directly from the *Create* menu and therefore does not need to be connected to a field anymore.

Port interconnection

This new feature links two ports so that port settings are synchronized across modules. The new *connect* Tcl command is available for all ports and enables ports to be connected to corresponding ports of another module of the same type. Example of usage (from the console command line):

```
OrthoSlice sliceNumber connect OrthoSlice2
```

connects port *sliceNumber* of *OrthoSlice* to the port *sliceNumber* of *OrthoSlice2*. To disable connection enter

```
OrthoSlice sliceNumber disconnect OrthoSlice2
sliceNumber
```

A new render mode, *none*, in the **MPR Viewer** removes the 3D rendering from the 3D viewer component. Only 2D slice updates are displayed. This can be used to improve the interactivity of the tool.

Editors

Segmentation Editor

A 3D crosshair option has been added to the 3D MPR tool. The tool is now controlled by a 3-state button and allows cycling through the list of states 3D MPR -> Crosshair -> None.

Selection tools like the Add/Subtract buttons in the Segmentation Editor are now drawn in red if their action would change the assignment of voxels not currently visible.

Two new navigation arrow buttons will change the currently active viewer to display the slice with the next or previous selection.

Display and masking has a new toggle *show* which hides/shows the blue mask on the slice views.

The Grow / Shrink buttons used to do an all-slices operation when *All slices* option is checked. This has been changed. Now these button trigger the corresponding 3D operation. The all-slices version can still be selected from the Selection/Grow(Shrink) menu.

Surface Editor

Tcl commands *checkHoles*, *fillHoles*, and *fillAllHoles* have been added to the Surface Editor.


GUI

Sub-applications Sub-applications now have a Help button.

Text field editing Text fields now accept new values when the user presses RETURN or clicks somewhere into the GUI. Previously, moving the mouse pointer out of the field triggered a focus change.

Preferences In the *General* tab it is now possible to specify the maximum number of documents (files and networks) displayed in the Recent Files menu.

Preferences can be saved to disk and reloaded later, or reset to the default values.

Pickable button A new button [] in the **Properties** area of each display module allows the user to disable/enable picking of its geometry in the 3D viewer. This can be used to prevent accidental changes when working with several modules that interact with the mouse, e.g. *OrthoSlice*, *SelectROI*, etc.

The *Pool* menu now has two new entries to enable or disable this option globally.

A new help menu option *Examples* opens a help page with links to demo scripts provided with the Amira software.

Technical Information

Supported Platforms

Windows – Windows XP/Vista/7, 32-bit and 64-bit editions

Mac OS – Mac OS X 10.5 (Leopard), 10.6 (Snow Leopard), Amira runs as 32-bit application.

Linux – Red Hat Enterprise Linux 5.5 for x86_64 or compatible. The software can work on other distributions too, but it is not guaranteed and verified.

Developer Option Requirements

Windows

- XP/Vista/7, 32-bit: Microsoft Visual Studio 2005 (VC++ 8)
- XP/Vista/7, 64-bit: Microsoft Visual Studio 2008 (VC++ 9)

Mac OS

- 10.5 (Leopard): gcc 4.0.x
- 10.6 (Snow Leopard): gcc 4.2.x.

Linux

- (RHEL 5.5): gcc 4.1.x.

Hardware Requirements

A CPU supporting SSE2 instruction set (Intel Pentium 4 and above or compatible).

At least 2 GB RAM.

A graphics card with OpenGL support and hardware accelerated texture mapping. Some visualization modules require graphics hardware with following vertex and fragment shader support:

GL_ARB_shader_objects

GL_ARB_shading_language_100

GL_ARB_fragment_shader

GL_ARB_vertex_shader

Recommended Hardware

CPU – Multi-core CPU with 2 GHz. On Mac OS X an Intel CPU is recommended.

Main memory – ≥4 GB.

Graphics card – A current "gaming" card from one of the main vendors (NVIDIA or ATI) with at least 512 MB video RAM is recommended. If OpenGL stereo support is needed (e.g. stereo projection or AmiraVR), an NVIDIA Quadro FX or an ATI FireGL / FirePro card with the appropriate driver must be installed.

Installation Notes

Windows runtimes installation The installer for both Microsoft Windows distributions now provides a mechanism to install the appropriate runtime libraries. The user is prompted at the end of the installation process to install the MSVC Redistributable Package. It is recommended to confirm installation if in doubt.

License Manager Due to security mechanisms in modern operating systems (e.g. MS Windows User Account Control) Amira needs to run with administrator privileges in order to be able to change the license file. When Amira is launched at the end of the installation procedure this is automatically the case so that saving the license file from within the License Manager is possible. For all subsequent changes of the license file Amira needs to be explicitly started with administrator privileges (Right-click the Amira icon, select "Run as administrator" from the context menu).

Restrictions and known issues

DICOMSend requires administrative privileges

Amira Developer Option on Mac OS X: You need to compile your packages in the optimize configuration. Debug compilation is currently not supported.

Deactivating full screen mode on Windows Vista and Windows 7 systems is currently hampered by not being able to see the right-click context menu. As a workaround the user may right-click into the viewer, hit the DOWN ARROW key four times and then the RETURN key.

Bugfixes

Segmentation Editor

A regression in the Segmentation Editor's Wrap Tool (Selection/Wrap) has been fixed.

Segmentation Editor sometimes crashed when merging two labels.

The function *Selection/Interpolate* sometimes failed when neighboring slices were selected.

Label fields being edited with the Segmentation Editor did not update information in the **Properties** of the label field object.

Filament Editor

Interactive tracing in the Filament Editor on single slice data crashed Amira.

The *Set Root* function set the Id of *Rank0* to 1.

The volume rendering activated with the *Preview* button used to block the GUI when large data (> 512³ voxels) were viewed since it did not automatically activate the LowRes only option known from module *Volren*. Now for large data this option is set automatically but cannot be de-selected. Use a separate Volren module in the Pool to view the image data in full resolution.

Surface Editor

Documentation

Quantification+ tutorial has been reworked.

Documentation of *SampleScalarField* has been added.

Documentation of *ViewBase* (parent class of modules such as *SurfaceView*, *Isosurface* and *GridVolume*) has been reworked.

Demo *A case study in Biofluidmechanics* has been added to the demos of the Mesh Option. The demo actually existed already in Amira 5.2.2 but could not be launched from the Help browser.

Miscellaneous

The following modules/commands did not copy the transformation of the source object, if any, to the result object: *ExtractSurface/CreateSurface*(Tcl command), *CastField*, and *Arithmetic*.

Some DICOMDIR files could not be loaded on Linux and Mac OS platforms.

Commands `setTranslation` and `applyTransform` changed the dimensions of the uniform scalar field by 1 in each direction on the second time they were called.

A *LandmarkSet* with only 1 landmark was not displayed

because its size was 0.

When *ViewerPlot* was used together with *Volren* the volume rendering could not be seen beneath the transparent plot overlay.

In module *VolumeEdit* the function *CreateMask* created a label field without material *Exterior*.

When converting a TIFF series with unsigned shorts (16 bit) to LDA the data range was rescaled to [0 ... 255].

For surface objects with a large number of triangles, the module *Measure->SurfaceArea* gave significantly different results depending on whether the user selected *patches* or *materials* mode. The internal accumulation buffer now supports higher resolution format.

File Formats

Vevo (.rdi/.rdb) reader did not preserve bounding box information.

Olympus (oib/oif) reader fixed several issues regarding version 2 of the file format.

Leica LIF reader did not support 16-bit time series data.

Manufacturer Information

Manufacturer Address	Visage Imaging GmbH Lepsiusstraße 70 12163 Berlin, Germany www.visageimaging.com
US Distributor	Visage Imaging, Inc www.visageimaging.com
Support Contacts	Web: http://www.amira.com/contact Email: amirasupport@visageimaging.com