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Users Manual

Jens Krüger & Tom Fogal

Scientific Computing and Imaging Institute, University of Utah  
72 S Central Campus Drive, 3750 WEB, Salt Lake City, UT 84112, USA

ImageVis3D Version 1.0

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# Introduction

Welcome to the world of interactive volume visualization! In this manual we are going to introduce you to ImageVis3D, a lightweight, feature-rich volume rendering application. That was specifically designed for rendering data which is significantly larger than the available memory of the machine. While ImageVis3D can take advantage of many recent advances in graphics hardware, advanced scheduling and caching algorithms ensure interactive performance even on older systems. We sincerely hope that ImageVis3D will improve the workflow in your environment and that you will have as much fun using it as we had developing it. If you should have a question, bug-report, or feature request, feel free to contact us at [iv3d-users@sci.utah.edu](mailto:iv3d-users@sci.utah.edu). Or use the build in reporting feature in ImageVis3D (see Section XVI on about details on this feature).

## Getting ImageVis3D

If you already downloaded and installed the latest version of ImageVis3D on your system you can skip this Section if not just read on.

### Downloading

ImageVis3D is a free open source program release under the MIT license, which basically means you can download it, change it, and do whatever you want with it for completely for free. Just note that legally we do not give you any guarantees for anything (see Section XXII). Practically, this means you can browse to <http://www.ImageVis3D.com>, click the download button and pick the latest binary that is suitable for your operating system (OS). If you do not know what you operating system is and whether it is 32 or 64bit please ask you system administrator or consult your computer’s owner’s manual. If you fell more like playing around with the latest and greatest in “development version” of ImageVis3D you can also browse to <http://software.sci.utah.edu/devbuilds/imagevis3d/> and download the latest build. These latest versions often offer new exciting features but are still under development and my not run as stable and reliable as the release versions that you can get from the “Download” site.

### Installation and Uninstallation

As the installation of ImageVis3D is differs from OS to OS we will describe the process separately for the most common operating systems.

#### Windows XP and above

On windows you can either choose to run the installer directly from our website (recommended) or choose download. If you have downloaded the installer to your system instead of running it directly you should have either have an “ImageVis3D-1.0-64.bit” or “ImageVis3D-1.0-32.bit” binary in your browser’s download folder (see Figure 1).

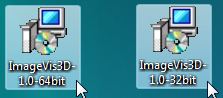


Figure 64bit and 32bit Windows Installer Packages

To start the installation process, double-click on that installer. On Windows Vista and Windows 7 you will be prompted by the “user account” control to allow the installer to run, please click “OK” to continue. Next, you will see the familiar windows installer dialogs, please simply follow the instructions in the wizard, as seen in Figure 2. We recommend that you leave all settings at their default values.

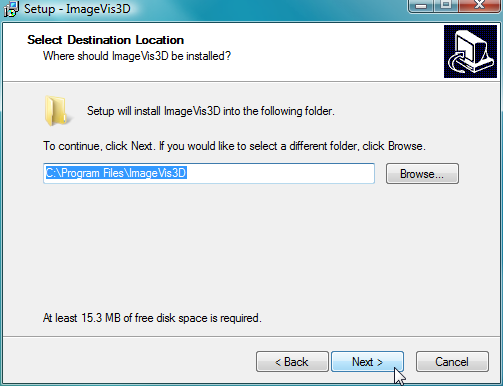
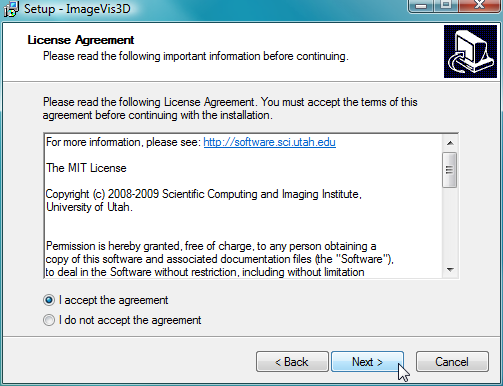
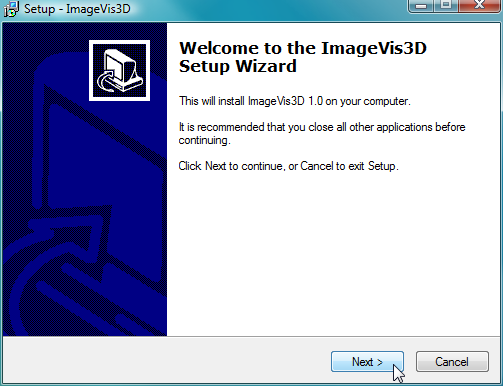
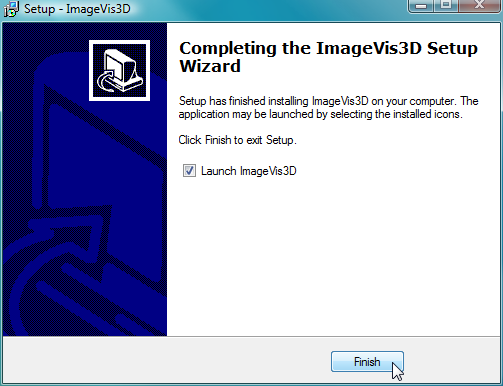
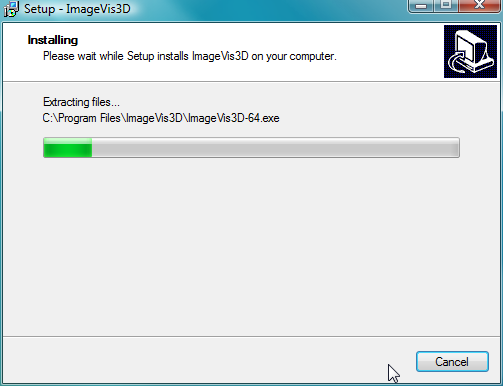
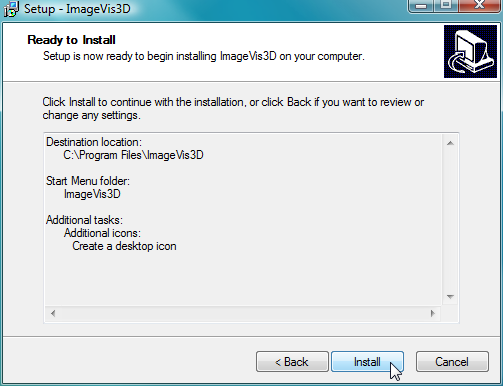
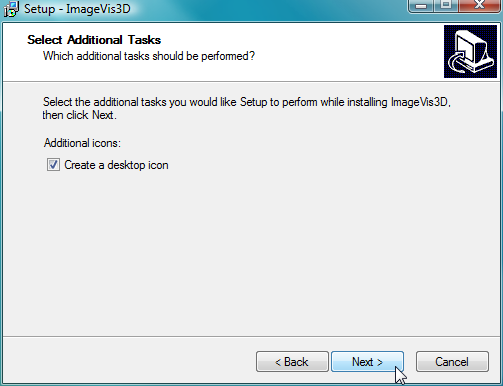
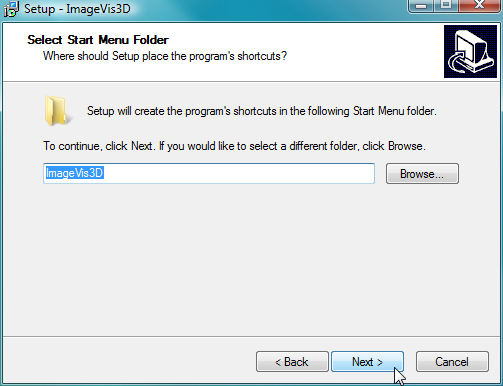
  


Figure The Install Wizard on Windows Systems

After the wizard has finished the installation it will automatically start ImageVis3D or – if you have deselected the option to do so – you have to start it manually by clicking on the new desktop item or by starting ImageVis3D from Windows’ Start menu (bottom left on most systems).

To uninstall ImageVis3D later all you have to do is to double-click ImageVis3D 1.0 from the software list (called Programs and Features on Vista and Windows 7) in the control panel.

#### OS X

On a Macintosh computer running OS X you simply download the DMG disk image regardless of what Macintosh computer you have. This one image contains ImageVis3D versions for multiple configurations and automatically picks the right one. If you perform the download with OS X default browser Safari, the entire installation process will happen completely automatically. After the DMG has been downloaded, mounted, extracted, dismounted, and finally deleted, you should see the ImageVis3D program in your download folder. If you want to you can now move it into the application folder, so it is stored alongside with all your other OS X applications.

If you ever want to uninstall ImageVis3D all you have to do is drag the ImageVis3D icon from the Download (or from the Application folder) into the Trash.

#### Linux

At the moment we are not offering any installation system for the various Unix like OSes. Please either download the binary tarball or download the source from the SVN serve at and compile it yourself (see Section XXII for details on to do this).

## Screenshots and Operating Systems

As mentioned before, ImageVis3D runs on all major operation systems, such as Windows, OS X, and Linux. While the overall look and feel of the program remains the same, it will look slightly different on operating systems, throughout this manual we will mainly use screenshots from a Windows Vista system thus a button a checkbox or a dialog may look slightly different. But as can be seen in Figure 3 this difference should not be a major problem, if you still find it impossible to understand a certain part of this manual feel free to send an email to [iv3d-users@sci.utah.edu](mailto:iv3d-users@sci.utah.edu) and we will gladly help you with your problem and will also make the necessary changes to improve this manual for everyone else.

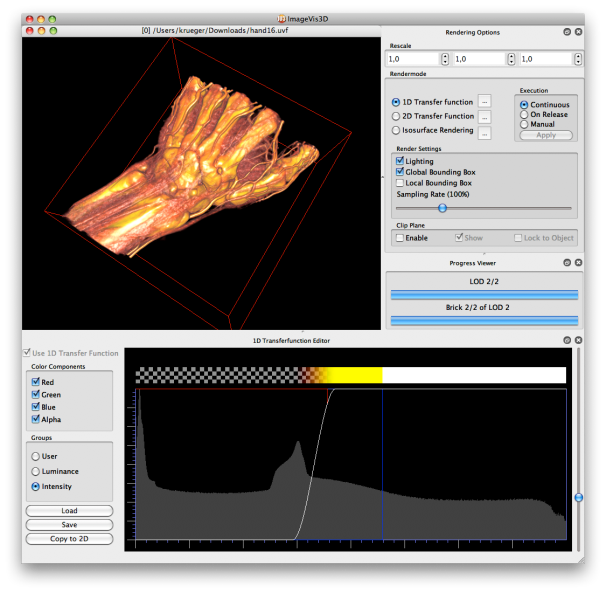
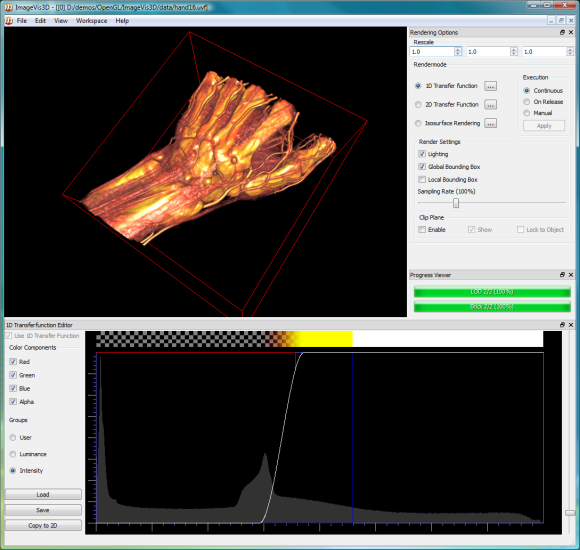
 

Figure ImageVis3D running on OS X and Windows Vista

## The First Start of ImageVis3D

When you start ImageVis3D for the very first time the “Initial Setup Dialog” (see Figure 4) will open up and ask you if you want to change the default settings ImageVis3D has picked. For an inexperienced user it is best to just click “No” and accept the defaults, you will later (in Section XV) learn how to change those settings if it becomes necessary.

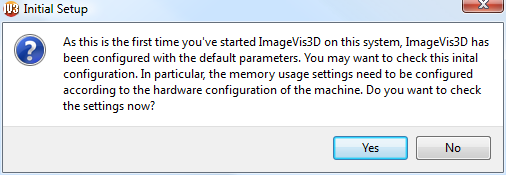


Figure The Initial Settings Dialog

If you accidently clicked “Yes” in “Initial Setup Dialog” do not worry just close the “ImageVis3D Settings Dialog” with either “OK” or “Cancel” or and no harm is done.

After you managed to pass the initial Setting/Setup phase ImageVis3D will start by presenting you the “Welcome Screen” (see Figure 5).

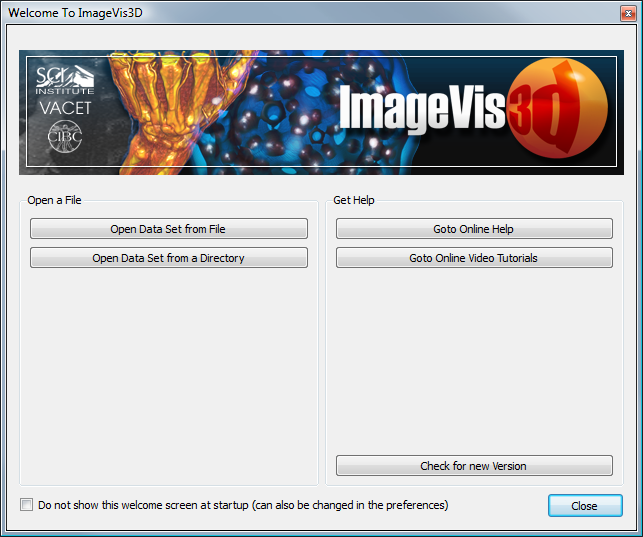
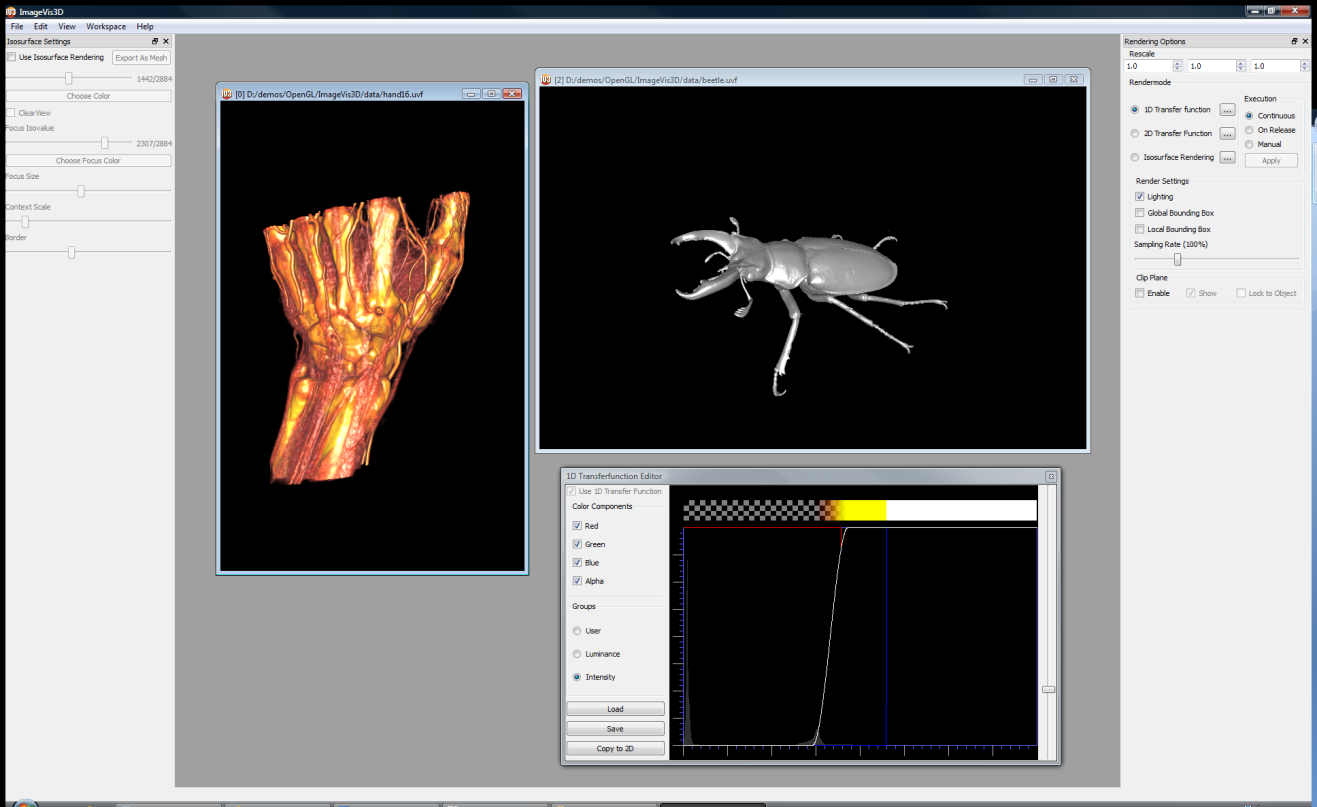


Figure The ImageVis3D Welcome Screen

# User Interface Basics

In this Section we will introduce the basic concepts of ImaveVis3D’s User Interface (UI). ImageVis3D was designed to be very intuitive if you already are already familiar with graphical user interfaces (GUI) in general. Figure 6 shows an annotated screenshot of ImageVis3D’s user interface during a visualization session.

**Main Menu**



**Status Bar**

**Render Windows**

**Main Canvas**

**Free Floating   
Tool-Widget**

**Docked Tool-Widgets**

Figure ImageVis3D's Anatomy

## The Welcome Screen

If you start ImageVis3D the “Welcome Screen” (see Figure 5). opens up, unless you disabled it (see Section XV on how to re-enable it if you want to). In this window you can open data sets, open the online help, see the video tutorials, or check whether you have the most recent version of ImageVis3D. Particularly helpful is that ImageVis3D keeps track of you recently accessed data sets and lets you load these directly with having to find them on disk (see Figure 7).

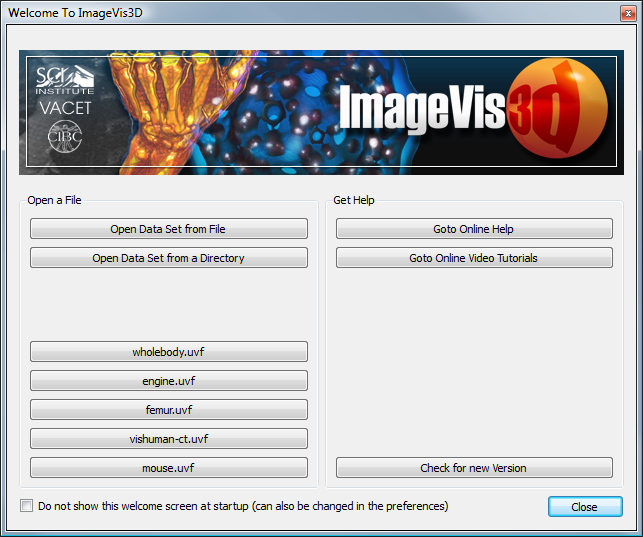


Figure The Welcome Screen showing the most recently used items.

## The Main Menu

Like most graphics programs ImageVis3D’s has a Main Menu from with the basic features are accessed (see Figure 8). Such as loading and saving from the “File”-menu or “Settings” from the “Edit”-menu (note that on OS X the Settings are located in the “ImageVis3D”-Menu on the top left as “Preferences”). The “View”-menu becomes important once we start to work with multiple data sets at once (for details see Section XII) while in the “Workspace”-Menu workspaces are loaded and saved and all of the tool-widgets (see Figure 6) are enabled and disabled, as ImageVis3D is primarily controlled through these tool widgets, this menu item is of special importance for the next Section. The “Help”-menu, finally, gives you access to the only help and the Update and Report features of ImageVis3D.

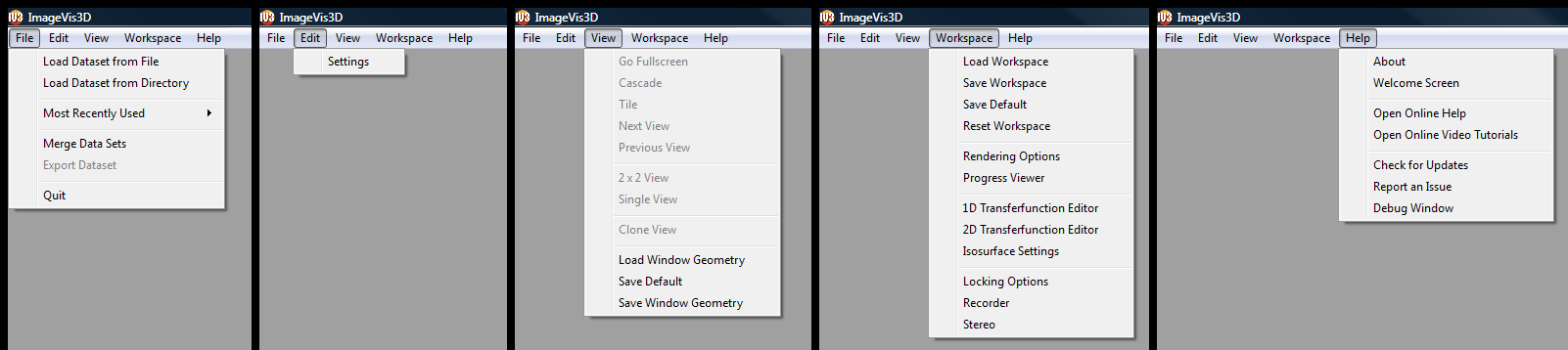
.

Figure ImageVis3D's Main Menu

## The Main Canvas

### Tool Widgets

Key elements in ImageVis3D’s user interface are the “Tool Widgets”. These user interface elements contain most of the controls you need to operate ImageVis3D. To make ImageVis3D’s interface as flexible as possible these tool widgets can be arranged freely by the user. It is also possible to completely hide such a widget if it is not needed, thus devoting more space to the actual Render Windows, that display the data set. In version 1.0 there are eight of these widgets (for a complete list see Section XX). In Figure 6 a few of these Widgets are shown, whereas two of the widgets are attached to the sides (left and right) and one floating freely. To attach a Widget to the sides but also the top and bottom of the ImageVis3D window simply drag it close to the boarder and release it. Please note that a Tool Widget can only be attached to a border of the main window if it fits, i.e. the main window is large enough accommodate the current Tool Widget at its minimum size. To detach a widget simply click on its window icon (second icon from the right in the top bar of every widget). To re attach that widget at the same attachment location, simply double-click the top bar. To show a Tool widget select it in the workspace menu, to hide a widget either click on the cross icon (rightmost in the top bar) or deselect it in the workspace menu. You can also resize the Tool Widgets just like any other window in you user interface by dragging their borders. By default ImageVis3D remembers the layout of all of the Tool Widgets when it is closed and restores them when it is restarted. Sometimes, however, it is beneficial to have multiple predefined Tool Widget layouts at hand for different workflows. Therefore, it is also possible to save and load additional workspaces via the “Load Workspace” and “Save Workspace” options in the “Workspace” menu (see Figure 8).

### Render Windows

The next important user interface element of ImageVis3D is the “Render Window”. It literally is the window to your data. In Figure 6 two such windows are shown (the hand data set and the stag beetle). Render windows are so called MDI childs of ImageVis3D, i.e. they are normal windows on your desktop that can be maximized, minimized, or windowed but are restricted to ImageVis3D’s main canvas. If you drag around your ImageVis3D main window, the Render Windows will follow. Note that detached Tool Widgets will are note restricted to the canvas an can be placed anywhere on your screen, even on another monitor if you have multiple monitors attached to your computer. To open a Render Window you need to Load a data set into ImageVis3D or clone an existing window. Also note that the arrangement options in the “View” menu (see Figure 8) apply to Render Windows. To interact with a data set simply left click and drag to rotate and right click and drag to move (see Section IX).

# Data Set Handling

The key component of a scientific visualization tool is of course the data. In this Section you will learn how to convert data, load it into ImageVis3D, and also export it for other programs to use (please note that for batch conversion there also exists a program called UVFConverter that ships with ImageVis3D and allows for command line file conversion).

## Loading Data

In this first subsection we focus on opening data files from disk, whether they are in ImageVis3D’s native UVF format or foreign formats.

### Loading Native UVF Data

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### Importing Data From a File

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### Importing Data From a Directory

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## Exporting Data

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### Exporting Volumetric Data

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### Exporting Mesh Data from an Iso-Surface

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### Merging Datasets

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# Interacting with the Data

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## Interaction inside the Render Window

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## Changing Rendermodes

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### Working with a 1D Transfer Function

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### Working with a 2D Transfer Function

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### Working with Iso-Surface Rendering

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### Working with ClearView

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## Clip Planes

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## The Render Window Revisited once more

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### Single Window vs. Four by Four View

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### Maximum Intensity Projection (MIP) View

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## Working with multiple Windows

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### Locking

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## Clip Planes

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## Stereo Rendering

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# Capturing Images and Sequences

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# Advanced Topics

## Changing Parameters

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## Reporting a Bug

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## The Debug Console

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## Running a Script

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# Appendix

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## List of all Tool Widgets

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### The Rendering Options

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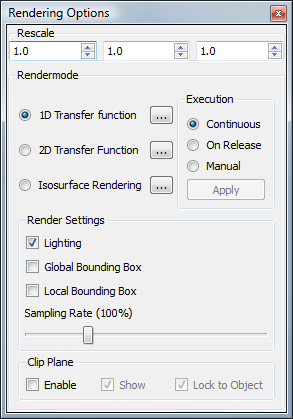


Figure The "Rendering Options" Tool Widget

### The Progress Viewer

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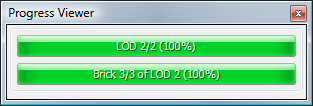
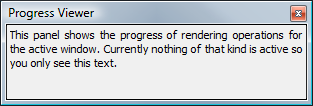
 

Figure The "Progress Viewer" Tool Widget in activestate (left) and inactive state (right)

### The 1D Transferfunction Editor

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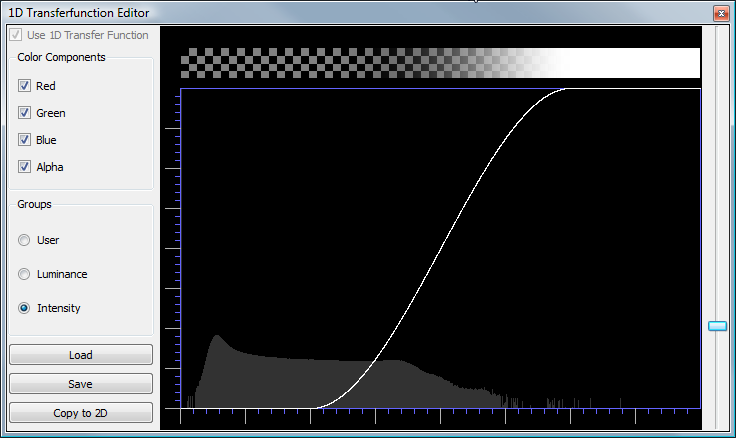


Figure The "1D Transferfunction Editor" Tool Widget

### The 2D Transferfunction Editor

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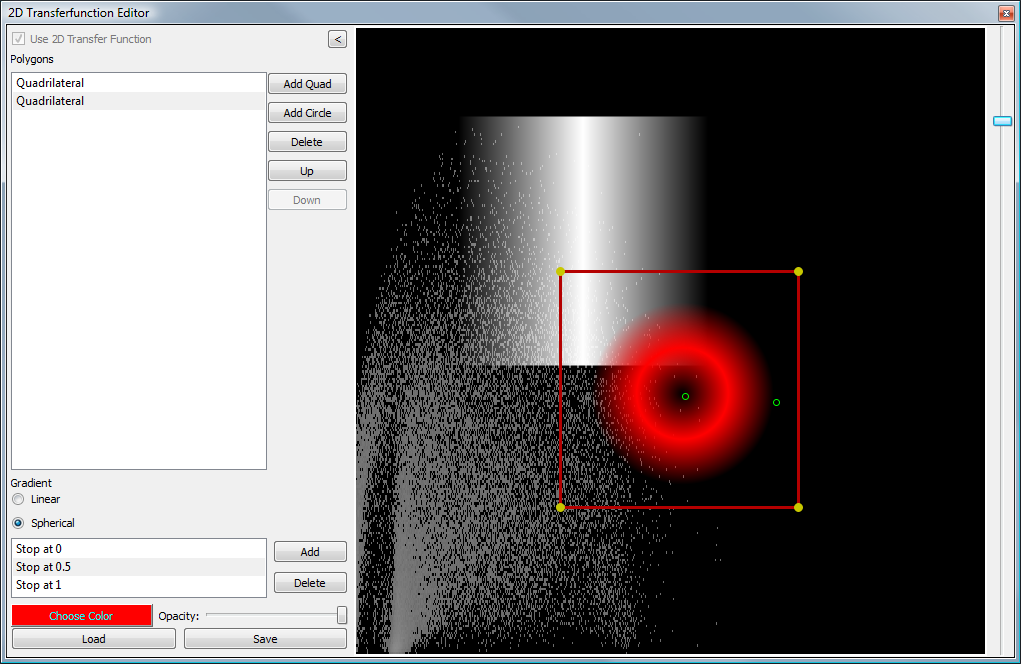


Figure The "2D Transferfunction Editor" Tool Widget

### The Isosurface Settings

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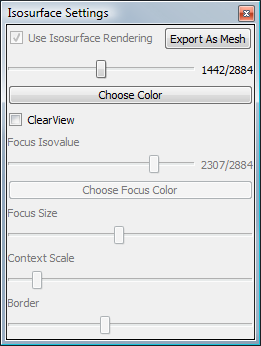


Figure The "Isosurface Settings" Tool Widget

### The Locking Options

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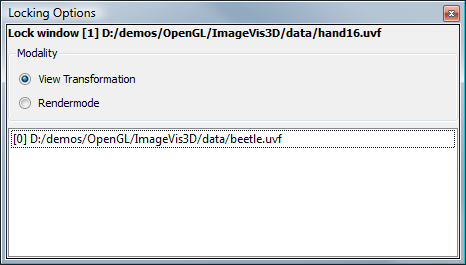


Figure The "Locking Options" Tool Widget

### The Recorder Widget

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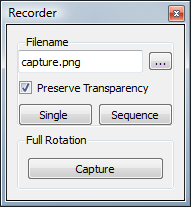


Figure The "Recorder" Tool Widget

### The Stereo Widget

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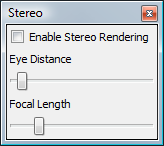


Figure The "Stereo" Tool Widget

## Keyboard Shortcuts

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## Command Line Parameters

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## Troubleshooting

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## Compiling ImageVis3D

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