Welcome

Welcome to the *Visualization Toolkit (VTK) User's Guide*. This book has been updated for VTK 4.0 and later versions of the *Visualization Toolkit* software.

VTK is an open-source, object-oriented software system for computer graphics, visualization, and image processing. Although it is large and complex, VTK is designed to be easy to use once you learn about its basic object-oriented design and implementation methodology. The purpose of this *User's Guide* is to help you learn this methodology, plus familiarize you with a variety of important VTK classes.

VTK is a large system. As a result, it is not possible to completely document all VTK objects and their methods in this guide. Instead, this guide will introduce you to important system concepts and lead you up the learning curve as fast and efficiently as possible. Once you master the basics, we suggest that you take advantage of the many resources available from the community of VTK users (see "Additional Resources" on page 4).

The *Visualization Toolkit* is an open-source code system. What this means is that dozens and perhaps hundreds of generous developers and users like you have contributed to the system. If you find VTK a useful tool, we encourage you to contribute bug fixes, algorithms, ideas, and/or applications back to the community. (See "How To Contribute Code" on page 204 for more information.) You can also support commercial firms such as Kitware to develop and add new features and tools.

1.1 Organization

This manual is divided into three parts, each of which is further divided into several stand-alone chapters. Part I is a general introduction to VTK, including—in the next chapter—a description of how to install the *Visualization Toolkit* on your computer. This includes installing pre-compiled libraries and executables, or compiling the software from the source code. Part I also introduces basic system concepts including an overview of the system architecture, and how to build applications in the C++, Tcl, Java, and Python programming languages. In some ways Part II is the heart of *User's Guide*, since dozens of examples are used to illustrate important system features. Part III is for the advanced VTK

user. If you are a developer, Part III explains how to create your own classes, extend the system, and interface to various windowing and GUI systems. Chapter 14 contains simplified object diagrams that provide an overview of the relationship of VTK objects, a summary list of filters, and a description of VTK file formats for reading and writing your own data. Chapter 15 describes the contents of the CD-ROM. And finally, the index is a handy tool for random access into the *User's Guide*.

1.2 How To Use VTK

There are two broad categories of users of VTK. First are class developers, who create classes in C++. Second, application developers use the C++ class library to build turn-key applications. Class developers must be proficient in C++, and if you are extending or modifying VTK, you must also be familiar with VTK's internal structures and design (material covered in Part III). Application developers may or may not use C++, since the compiled C++ class library has been "wrapped" with the interpreted languages Tcl, Python, Visual Basic, and Java. However, as an application developer you must know something about the external interface to the VTK objects, and the relationships between them.

The key to using VTK is becoming familiar with its palette of objects and the ways of combining them. If you are a new *Visualization Toolkit* user, begin by installing the software. If you are a class developer, you'll want to install the source code and then compile it. Application developers may only need the precompiled binaries and executables. We recommend that you learn the system by studying the examples (if you are an application developer) and then studying the source code (if you are a class developer). Start by reading Chapters 3, which provides an overview of some of the key concepts in the system, and then review the examples in Part II. You may also wish to run the dozens of examples distributed with the source code found in the directory `VTK/Examples`. (Please see the file `VTK/Examples/README.txt` for a description of the examples contained in the various subdirectories.) There are also several hundred tests found in the source distribution; such as those found in `VTK/Graphics/Testing/Tcl` and `VTK/Graphics/Testing/Cxx`, most of which are undocumented testing scripts. However, they may be useful to see how classes are used together in VTK.

1.3 Additional Resources

For more information about the *Visualization Toolkit* we recommend the following resources.

- The text *The Visualization Toolkit An Object-Oriented Approach to 3D Graphics (Second Edition)*. This book goes into detail about many of the algorithms, data structures, and system issues found in VTK. The text is published by Prentice Hall and available from `amazon.com`, local book stores such as Barnes & Noble or Border's, or from Prentice Hall directly. ISBN 0-13-954694-4, 646 pages, 40 color pages, hard bound, with CD-ROM.
- The Web pages `http://public.kitware.com/` contain pointers to many other resources such as on-line manual pages, a FAQ, and an archive of the `vtkusers` mailing list (see below). In particular, the Doxygen manual pages are absolutely wonderful. Although they are available on the companion VTK CD, you can also view them on-line at `http://public.kitware.com/VTK/doc/nightly/html`.
- Many other VTK users and developers also maintain Web pages. One recommended site is Sebastien Barre's links to VTK resources `http://www.barre.nom.fr/vtk/links.html`.
- The `vtkusers` mailing list allows users and developers to ask questions and receive answers; post updates, bug fixes, and improvements; and offer suggestions for improving the system. There are instructions at `http://public.kitware.com/mailman/listinfo/vtkusers` describing how to join this list.
- Commercial support and consulting are available from Kitware at `http://www.kitware.com`. Kitware also sells and supports commercial products built with VTK including VolView (volume rendering/image processing), *Acti*Viz for Microsoft Visual Basic/COM/ActiveX support, and the GoFly analysis tool for complex mechanical systems. See the Web pages for terms and pricing.

As a last resort, you can e-mail Kitware at `kitware@kitware.com`. We will answer questions as time and resources permit.