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The Vox-L Visualizer Demonstration Disk: Interactive Volume Visualization

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REQUIREMENTS:

System Requirements:

OS supported: MS WINDOWS NT and Windows 3.1 (via Win32s)
Unix / Motif for many platforms

Processor : Intel 386, 486, Pentium
By special request (single and multithreaded versions):
Mips R4000 series, Mips R4400
Digital Equipment's Alpha AXP

Memory : The application should be run on systems with at least
8MB of RAM with a swap file greater than 10MB in size,
useful visualizations require at least 12MB of RAM.
Start with a smaller model first, then select
or, preferably, a computer with more memory, if possible

Video : Currently only 8-bit video cards are supported, true
color (24-bit) will soon be supported. Lesser video
cards will show dither patterns to simulate the real
colors assigned to the volume model.

INTRODUCTION:

The Vox-L Visualizer is meant to aid technical and scientific professionals who need to work with three-dimensional image data. For example, our volume visualization software will help doctors interactively view and manipulate patient data generated from NMR (Nuclear Magnetic Resonance) PET (Positron Emission Tomography) or CAT (Computed Axial Tomography) in a three dimensional format which is much more intuitive and more significant than traditional methods. True ray-traced volume visualization allows users to learn more about their data than simple slicing or iso-surface representations (see the technical summary in the Vox-L Help File -- call 617.937.8330 during business hours if you did not receive a copy or are unable to view this file).

INSTALLATION:

INSTALLING WIN32S:

If you are not running MS Windows NT it is necessary to install the Windows 32-bit Subsystem (Win32s) in order to run the Vox-L demonstration. Insert the Win32s diskette, from the Program Manager select File, then Run, enter A:\SETUP.EXE as the program to start. The Vox-L Visualizer can now be installed after Windows has been restarted (which installing Win32s will require you to do).

INSTALLING VOX-L:

Place the diskette containing the DEMO version of Vox-L in your floppy drive. From Program Manager select File, Run and type *A:\SETUP.EXE* as the program to start. The installation program will prompt you for a path in which to install the program, sample dataset and documentation.

Note: For users installing from a hard drive or CD-ROM, when using Program Manager to run the installation, please specify the complete path where the Vox-L installation files reside in addition to the setup program name. Thus:
Select File, Run (from Program Manager) and type
C:\NEWAPPS\VOX-L\SETUP.EXE
where *C:\NEWAPPS\VOX-L* is the path of the demonstration disk.

SYSTEM RESOURCES:

Because of the large system requirements (see below) we have included an interactive HELP file which demonstrates the majority of the features offered by the Vox-L Volume Visualizer. In the event of minimal system resources (storage space, limited memory, etc.) one may manually install the HELP file (approximately 800KB) by using the EXPAND command in DOS. Thus, assuming the file *VOX-L.HL_* was in drive A, one would type:

```
EXPAND a:\VOX-L.HL_ c:\PATHNAME\VOX-L.HLP
```

We suggest the minimum configuration to run the Vox-L Visualizer should be a 486 DX-33 with at least 12MB of RAM to run interactively. Non-interactive visualization can also be accomplished on lesser platforms, such as a 386SX with a math coprocessor with 6MB of RAM.

PRODUCT SUPPORT:

We hope that your use of the Vox-L Visualizer Demonstration will be enjoyable and trouble-free. It is our intention to provide the best possible product and documentation. We understand that problems may arise and would like to be informed of any problems that you may be experiencing, to better improve our product and its' usability.

You may reach our Product Support staff in several convenient ways.

E-mail: techhelp@dataspace.com

FAX : 617.937.8331 -- Fax Back product support

VOICE SUPPORT:

For urgent problems/questions, or limited access to the above contact our main offices at 617.937.8330

Information to Give

When contacting Vox-L Technical Support in any of the above methods, please be prepared to provide as much information about the problem as possible. Include the command(s) you have tried to use, and what the results were and note why you feel you have a problem.

When faxing a problem, a print out of any error messages is often helpful in determining a solution.

Helpful information to include:

Problem Description

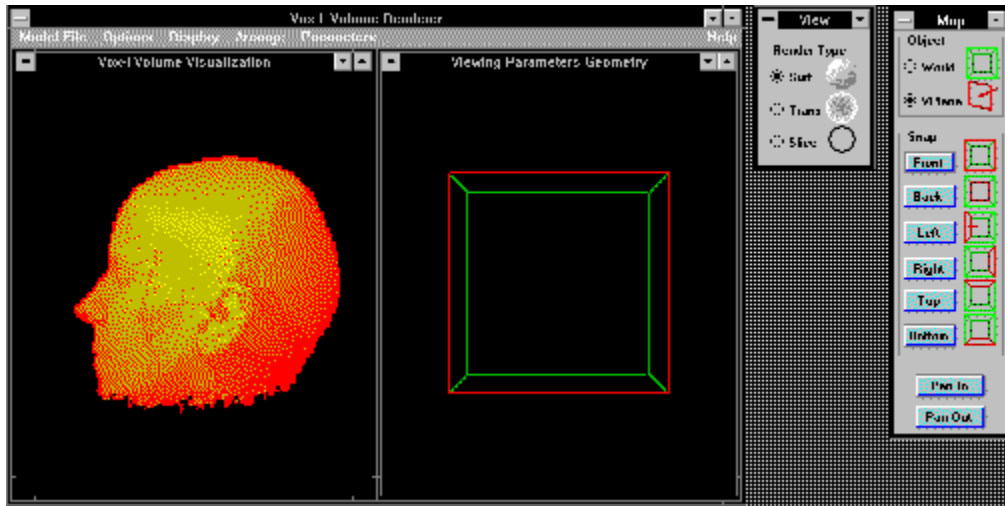
Be sure to include the following. Use as many additional sheets as necessary

- > What you are trying to do
 - > What do you expect to happen
 - > What did happen and why it is a problem
 - > Copies of any error messages
-

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COMMAND REFERENCE:

When run, Vox-L creates an Multiple Document Interface (MDI) along with two floating dialog boxes. These floating dialog boxes allow the user to manipulate the volume for the desired affect. The MDI parent window creates two windows when activated via a file load/model request. One window displays the 2D projection of the model, while the other is a cube used to rotate and pan into/out of the "model space".



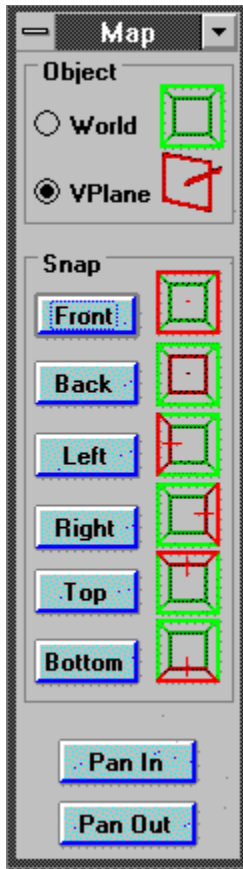
The Vox-L Visualizer as it appears on screen after first loading a file

The following sections will indicate how the individual components of the program are used.

In order to quickly get a feel for the power of the Vox-L Visualizer, you may also simply press the lowercase "d" key to begin a rotation sequence which will gradually rotate your perspective and re-render from each new angle. The rotations may be stopped by pressing uppercase "D".

The Map Dialog Box

This dialog box contains radio buttons for the VIEWING PLANE and the WORLD. The Viewing Plane is represented by a red plane set flush to the face of the cube upon initialization. This Viewing Plane is the user's perspective relative to the "model space" or World. The Viewing Plane may be rotated by holding down the right mouse button and releasing when in a desired location. Upon release the program will re-render the volume from the given perspective, this may require several seconds.



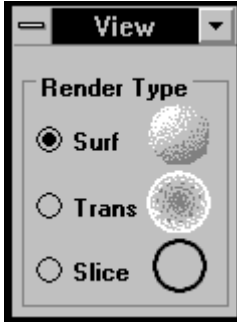
The World is represented by the green cube and may be rotated with the left mouse button. The release of the left mouse button will not trigger a re-render since there has been no change in the user's perspective. Thus the rotation of the World is mainly a visual aid for the user to re-orient herself within the context of a particular view of the volume.

The SNAP buttons allow the user to quickly move to a generic view of the volume. One may move either the Viewing Plane (represented in red) or the World (represented as the green cube). Again moving the Viewing Plane will cause a re-render which may take several seconds. The user controls which object will be "snapped" by selecting the radio button of that object (either the Viewing Plane or World). For example, snapping the World to the front will orient the green box so that its front face is facing you. If you then snap the View Plane to the left, the red viewing plane which determines the rendering angle will appear on the left hand side of the green box, thus producing a rendering of the model as if one were "looking into the box from the left hand side."

By depressing either Pan In or Pan Out, the Viewing Plane will be moved either into or out of the green box; effectively cutting into the model space. This method of clipping the model, known as "render-plane clipping," allows the Vox-L Visualizer to maintain interactive speeds while giving the user complete control over the viewing parameters.

The View Dialog

This dialog box allows the user to select the type of rendering she wishes to use on the given volume. This may be changed at any time. There are four different types of rendering available.



- Surface rendering -- rays are traced through the world until a surface is hit
- Transparent rendering -- (only when the Slider Bar is set to 0)
A virtual x-ray of the volume
- Translucent rendering -- Allows the surface to be viewed according to the most distinct data points. This is controlled via the slider bar (from 1% -- 100%=Surface rendering)
- Slice rendering -- View a slice of the 3d dataset -- will be blank unless the user has "panned into" the model. See information on the the Map Dialog Box.



To access the slider bar, use <Alt> O, R, T to select the Options Menu, Rendering Type, and Threshold selections, which brings up a slider bar. Press Preview to show the result of your change, and CANCEL to close the dialog box and undo changes. Close hides the dialog box and makes your change current.

Main Window



File -

The Mathematical Models:

Hyperboloid -- a voxelized hyperboloid

Cone -- a voxelized cone

Monkey -- voxelized mathematical "monkey point" also known as a triple saddle point

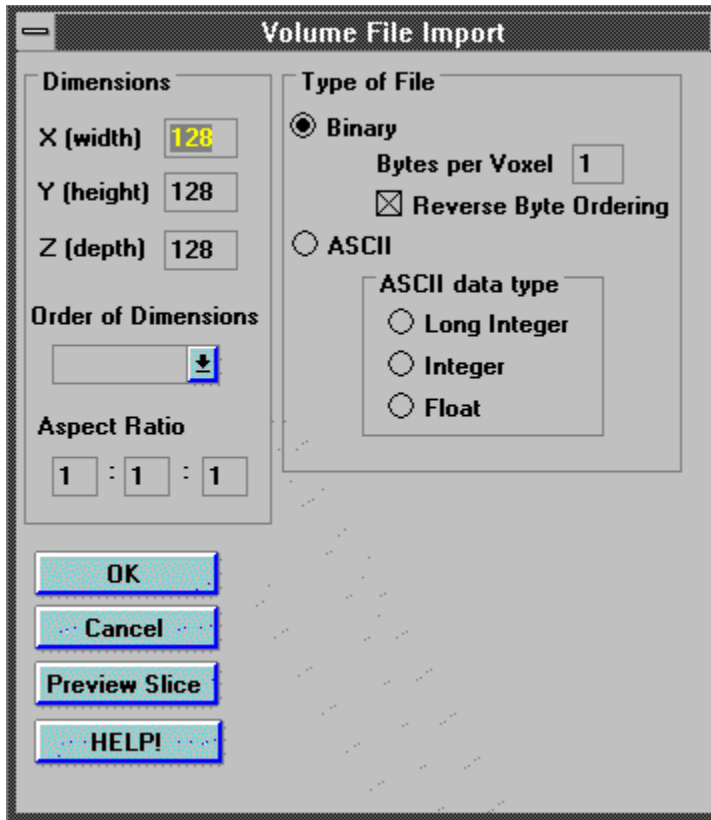
Combined -- Union of Cone and Monkey models

Note: These mathematical models take a few moments to generate so please be patient!

Note: -- The Demonstration version has the Load File option disabled with the Small MRI Head menu option included for viewing.
-- The only volumetric data file included with this version is a specially compressed, low resolution sampling of an MRI (Magenetic Resonance Imaging) data set of a human head. It has been specially created to distribute on small media (1.44MB 3.5").

In the complete version of the Vox-L Visualizer, when Load File is selected, the user is presented with a Volume File Import Dialog.

The Volume File Import dialog shown below allows users of the complete Vox-L Visualizer to easily load files written in most standard data formats. The ASCII option facilitates the generation of user-created macros which translates from otherwise unreadable data files into files the Visualizer can import.



Options -

Grab ViewPlane (Rt. Mouse Button)
 Grab World (Left Mouse Button)

Reminder of which mouse buttons to use to manipulate various objects in the Map window.

Snap World/ViewPlane --

place the World/Viewplane to orthogonal view relative to original position. For example, snapping the World to the front will orient the green box so that

its front

face is facing you. If you then snap the View Plane to the left, the red viewing plane which determines the rendering angle will appear on the left hand side of the green box, thus producing a rendering of the model as if one were "looking

side of

Front
 Back
 Left
 Right
 Top
 Bottom

Rendering Type -

Transparent -- Translucent mode/X-ray mode (when Slider=0)
 Surface -- Surface rendering
 Slice -- Slice rendering

Threshold Value -- manipulate the slider bar, controlling the translucency of the model (when in Transparent rendering mode) or the values of the voxels shown, thus a thresholding bar (only in surface rendering mode)

Display -
 Render -- trigger a re-render (redraw)

Show/Hide View Control -- show/hide floating dialog boxes
 Show/Hide Map Control -- show/hide floating dialog boxes

Arrange -
 Cascade -- basic MS Windows functionality - cascades windows
 Tile -- Tiles windows, the default mode
 Icons -- arranges icons at the bottom of the main window

Parameters -
 Stereo on/OFF -- Stereoscopic visualization on/off (will see two images without a stereo monitor, default OFF)
 Interp on/OFF -- For interpolating images -- higher quality -- longer rendering times (default is OFF)
 Grad Shad ON/off -- Gradient shading (default is ON)

Note: -- Stereo and Interpolation have been disabled for the demonstration.

Help -
 Contents -- Vox-L Help File
 About... -- Displays version information