VIRVO

Virtual Reality Volume Rendering

VIRVO is an open source framework for direct volume rendering. It is an integral part of the COVISE visualization and simulation environment, which was developed at the computing center of the University of Stuttgart. The development of VIRVO was initiated at HLRS within German Collaborative Research Centers 382 and 374. VIRVO is developed further within the DeskVox project on GitHub.

Volume rendering is used to display three dimensional scalar datasets, for example the temperature distribution in a car cabin or proton densities in MRI scans (see image below). Traditional approaches display only a subset of the dataset, most of the data can only be displayed by varying the selected parameters. With direct volume rendering, the entire dataset can be displayed in one image. Every scalar value is assigned both a color and a transparency by a user definable transfer function. VIRVO also has the capability to simultaneously display multiple channels of scalar values.

The most frequently used technique to display volume data is by slicing the dataset and displaying it with a stack of textures (3D textures). This requires large texture memory on the display computer.

VIRVO offers alternative techniques, which render the volume data on a remote and powerful parallel computer. The display machine receives only the rendered images and does not have to deal with a large amount of volume data. The shear-warp algorithm is used for rendering, which can render volume data very quickly and in software, without the need for cutting edge hardware on the display machine. For higher image fidelity, vectorized CPU ray casting can be used. The figure below shows the topology of the system.