

3D SCANNING TECHNOLOGIES

SHOWCASE

Visualization Technology at its Best

VGStudio MAX

Volume Graphics develops and markets 3D graphics technologies and application software for multidimensional image processing and analysis. The company's history started more than 10 years ago when the founders developed the first real-time volume rendering hardware system. Today, Volume Graphics provides 3D voxel graphics technology to the healthcare industry as well as software for industrial markets—mainly in high tech areas like the aerospace and automobile industry—and scientific applications.

Volume rendering, or more generally spoken volume graphics, is a sub-specialty of 3D computer graphics which is concerned with the discrete representation and visualization of objects represented as sampled data in three or more dimensions. A volume or voxel data set is a three-dimensional array of voxels. The term *voxel* commonly used in 3D imaging is defined in Wikipedia (a combination of the words **volumetric** and **pixel**) as a volume element, representing a value on a regular grid in three dimensional space. It is analogous to a pixel, which represents 2D image data. Using voxels to describe 3D objects has inherent advantages for applications needing visualization of irregular objects, or where the interior structure is important.

While today's widely used 3D computer graphics uses polygonal meshes to represent an object by its surface, Volume Graphics uses—voxel 3D or volumetric pixels—as basic element to represent not only the surface but also the entire internal geometry of an object. Volume Graphics' visualization technol-

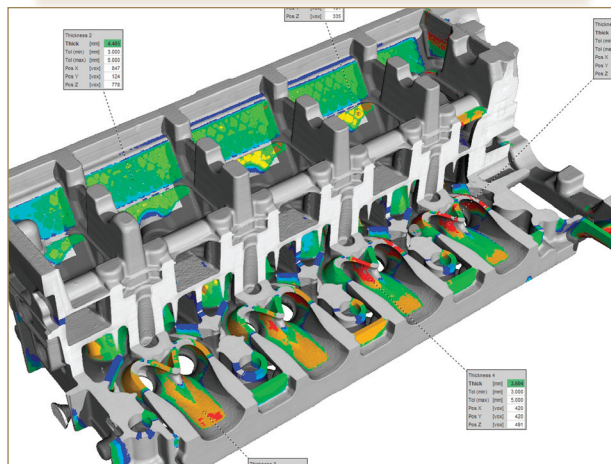
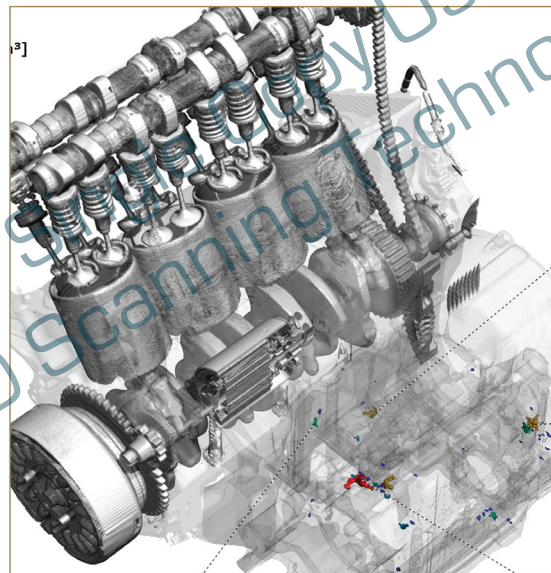
ogy is superior to polygon based 3D graphics in terms of image quality and performance when highly complex objects with fine details are to be visualized.

Computerized Tomography (CT) and 3D imaging techniques have become essential technologies in industrial applications, e.g. in non-destructive testing, quality control, rapid prototyping and reverse engineering. Therefore, the effective visualization and analysis of volumetric, so called voxel data, has become

key. Volume Graphics' innovative VGL technology has revolutionized the industrial use of voxel data. While in the past computerized tomography data was processed in time consuming "slice by slice" approaches, or directly converted to a polygonal surface representation (STL files) the new VGL based VGStudio software products offer the first easy to use interactive 3D voxel data processing software environment.

VGStudio uses advanced VGL based ray tracing to render data as volumes, slices, maximum intensity projections, X-ray or sum-along-ray images. Full control of opacity values enables the user to make any object or data value transparent, translucent, or opaque. Arbitrary color mapping allows false color renderings. Slices can be rendered in orthogonal planes or at any arbitrary angle.

Volume Graphics' software products are utilized in many industrial applications such as first article inspection, product development, failure analysis, reverse engineering and rapid prototyping. More specifically, the software is used for quality control material anal-



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ysis, for example void, porosity, crack, defect detection in metal or plastic castings or the analysis of composite materials. The VGStudio software is well suited for geometry analysis—wall thickness analysis and nominal/actual comparisons with CAD models and other classical metrology applications. The advantage of using CT data together with VGStudio MAX for geometry analysis is that all the part's geometry—both external and internal—can be analyzed without destroying the object.

VGStudio MAX 2.0 is the first product on the market specialized for data analysis. Eliminating the need for data conversion reduces measurement uncertainty and reduces overall processing time, this is especially important in a series inspection or in future inline CT data analysis scenarios.

VGStudio MAX's application kernel is tailored to work with CT and point cloud or surface mesh data. This means that VGStudio MAX joins the worlds of CT and "CAD" data processing with its unique abilities to perform nominal/actual comparisons of voxel and surface mesh (CAD) data sets. Measurements and analyses can be performed **directly on voxel data**, thus eliminating the need to convert voxel data into other data representations, e.g. point clouds or surface meshes.

Using industrial CT as a CM device is an accepted technology in the industry, but it is still new compared to optical scanning technologies. There are currently no DIN or ISO standards established for the technology. Volume Graphics is participating in ongoing research projects with the German National Metrology Lab in Braunschweig with the VG Studio MAX CM-Module. These projects could be considered as a pre-stage towards a future standardization program.

Volume Graphics' VGStudio MAX is a recognized tool in industrial quality control and computerized tomography. The VGStudio MAX software is able to import volumetric CT data from most of the CT scanner manufacturers. In addition, many of the CT scanner systems currently on the market already generate a VGStudio MAX compatible file format.

Since CT data sets are typically very large (2GB data sets are typical and data sets up to 16 GB are commonly processed) it is important for software such as VGStudio to be optimized to process the large data sets data in a reasonable time and to visualize the data in real time.

Visual Graphic's recommends the following computer hardware configuration for a professional user in the CT industry: multi-core, multi-processor PC running a 64 bit operating system (XP 64 Bit, Vista 64 Bit, Linux 64 Bit or Mac OSX). The multi-core, multi-processor hardware is recommended since VGStudio MAX takes full advantage of such hardware, using its fully multithreaded implementation. Depending on the customers maximum data set sizes, it is recommend that twice the amount of RAM be installed, e.g. if an application generates 2 GB data sets, than the system should be configured with at least 4 GB of RAM installed. Finally the computer graphics hardware should be a modern Nvidia or ATI board supporting the OpenGL 2.0 standard.

*For more information on the VGStudio MAX contact
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volumegraphics.com*

Founded in 1997, Volume Graphics GmbH has established itself as one of the world's leading provider of 3D volume graphics software components. Volume Graphics software technology and application software is licensed or used in healthcare, industrial and scientific applications. Volume Graphics' core voxel technology VGL® is the result of many years of experience, advanced research and development in volume rendering soft- and hardware. In April 1998 Volume Graphics released the VGL 2.0, the worldwide first platform independent graphics API which combines volume rendering with standard OpenGL polygon rendering. The VGL graphics technology provides CGI manufacturers with a low-cost, fast route to adding leading edge 3D imaging capabilities.



Volume Graphics is privately owned, based in Heidelberg, Germany and supports customers worldwide.



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