Development of CT Volume Rendering Method

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1. Introduction

Lately, thanks to the spread of CT Spiral Scan, volume data with high continuity in the direction of the body axis can be obtained at high speed and at high resolution. The SHIMADZU Slipring CT, SCT-7000TX is equipped with a 3D image processor as standard, which can effectively and immediately obtain 3D data on the main console itself. We have recently developed the Volume Rendering Method as the newest CT application to step up the 3D image processing. High quality 3D images can be obtained by fully utilizing the high speed processor to shorten the processing time to half and by shading to reflect all the voxel CT numbers in the range.

2. Volume Rendering Method

The 3D Surface Rendering Method conventionally includes the SCT-7000TX as standard. Shading is obtained by using the Gray Level Gradient Method to reflect 3D density inclination on the surface border detected using a threshold value. Fig. 1(left) shows a 3D lung image processed via this method. The excellent shading displays even the minute details clearly, however at the edge of the pulmonary artery, where the boundary area is rapidly changing, unnatural aliasing still remains due to the binary effect. In addition, the peripheral blood vessels are displayed in pieces.

In contrast, in this newly developed Volume Rendering Method, light transmitting characteristics and opacity are allotted to each CT number to control the light source attenuation in the eye direction for all the voxel CT numbers. At all the volume points, the brightness value is found by multiplying the incidental light by the voxel opacity based on shading calculated via the Gray Level Gradient Method. These values are integrated in order of the eye direction to obtain a 3D image. Fig. 1 (right) shows the image obtained via this method. The vascular edge shading is more naturally and more smoothly displayed than that in the conventional method. In addition, even the small

Fig. 1 3D lung images in Surface Rendering (left) and Volume Rendering (right).

Fig. 2 Difference between Surface Rendering Method and Volume Rendering Method.
peripheral blood vessels can be much more clearly displayed. Fig. 2 shows the difference between the two methods, and Fig. 3 shows a comparison of between the two in displaying the cerebral arteries. Semitransparent displays can be attained by changing the characteristic of opacity as shown in Fig. 4.

The Volume Rendering Method, which is excellent for displaying various images, requires processing large amounts of image data all over the volume. This processing time can be reduced to half by fully utilizing the standard high-speed processor. The processing speed can be increased four times by adding an option. Fig. 5 and Fig. 6 show 3D images created via the Volume Rendering Method.

3. Conclusion

This newly developed Volume Rendering Method is a 3D image processing method with a highly improved application for various CT clinical fields such as high resolution vascular image diagnosis. We believe this method will assist in the most advanced medical treatment. In the future we also plan to construct a 3D integrated environment of high completion as an easy and exact application in the clinical field.