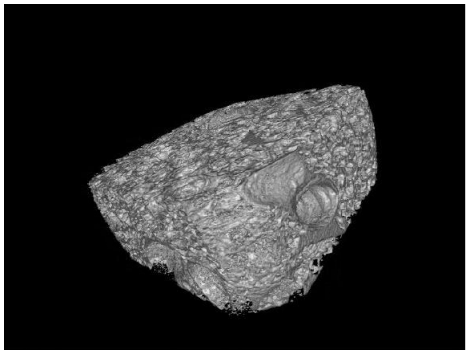

Fig. 9. Image of the whole sample specimen produced with volume rendering.

4.3. Example 3: Microstructure of lung tissue

The third example is the visualization of microstructure of the tissue of the lung. Source data was obtained by scanning a piece of an inflated fixed lung with micro CT scanner. Its spatial resolution is 0.2 μm approximately. Let us omit here detailed explanation of medical or anatomical contents of the structure. We would like to notice that the sample was made after a piece of an anatomical sample was dried. Therefore the structure seen here is a kind of skeleton structure of the architecture in living organ. However the approximated shape was preserved because the sample was filled with air after it was extracted and then dried (GROSKIN, 1993). The whole of the piece of the sample is shown in Fig. 7. Figure 8 shows an example of a slice of the CT image, and Fig. 9 is a VolR image of the whole of the sample. The real size is about 5 mm^3.

Let us show in Fig. 10 a VolR image with the viewpoint inside the piece of the sample used here. We can see the sophisticated architecture of parenchyma of the human lung, peripheral structure of thin bronchial branches, alveolar duct, alveolus etc. Basic units forming the lung architecture are the alveolus and the alveolar ducts. The number of alveolus is a key determinant of the lung architecture, and has been counted in various ways (OCHS *et al*., 2004). In this sample, however, individual alveolus is expected to be observed directly, because the mean size of a single alveolus was about 4.2×10^6 μm^3 (OCHS *et al*., 2004). The total number of alveoli was estimated as 480 million according to (OCHS *et al*., 2004). This value was derived by applying classical stereology to 2D sections observed by light microscope. Apart from medical or anatomical meanings, we can see complicated 3D network architecture. By shifting the viewpoint a little we see different views of this architecture. In the case of Fig. 10, the viewpoint is considered to be located inside a peripheral bronchus branch (left), and in the peripheral vein (right).

Shape features characterizing this architecture have not been proposed, nor been measured. In (OCHS *et al*., 2004), the Euler number of this architecture was estimated only by stereological method. In (MATSUBARA *et al*., 2003, 2004), the method proposed in (TORIWAKI and YONEKURA, 2002a, b) was applied to calculate 3D digital Euler number and the connectivity index from a 3D binary picture obtained by the threshold from the 3D gray