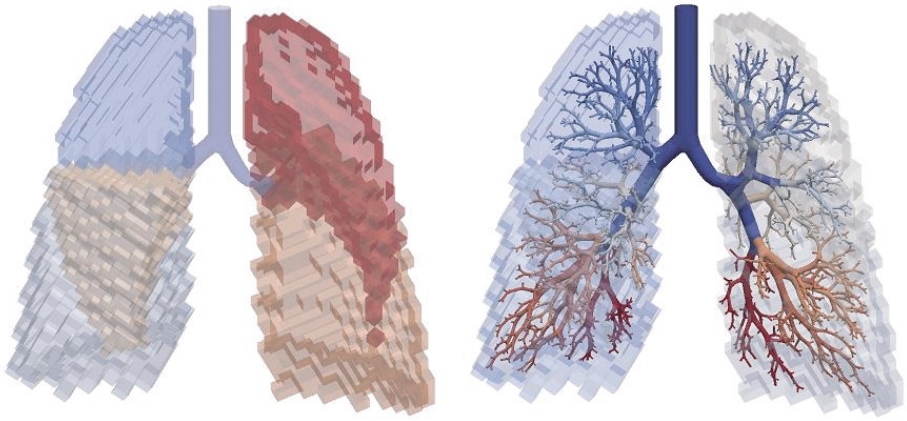

Fig. 2. Five-lobar model at TLC. Left: an airway tree down to lobar bronchi with five lobes. Right: an airway tree model of 2,921 branches is superimposed on the five-lobar model.

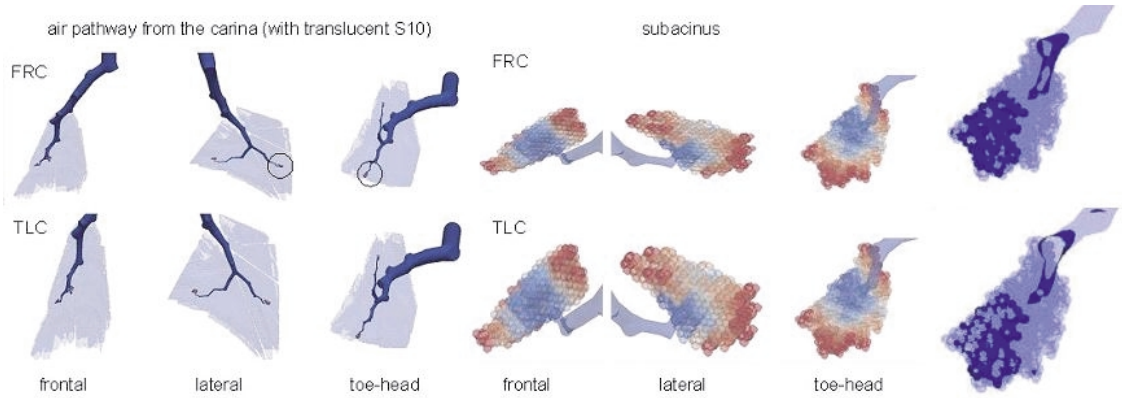

Fig. 3. Air pathway models from the trachea to two subacini. The whole region of the basal posterior segment in the right lower lobe is superimposed translucently. Magnified images in the right half are the dorsal subacinus. The right-end pictures are horizontally thin-sectioned images with 0.25 mm in thickness.

This equation indicates that each parenchymal region is approximated by a set of about 1000 cubes. To be more precise, the exponent of D is slightly smaller than 3.0 (Kitaoka *et al.*, 1999).

Figure 2 depicts a lobar bronchial tree model with five lobes. An airway tree model of 2,921 branches is superimposed in the right picture in Fig. 2. The end of each lobar bronchus is connected continuously with a cube in the lobe so that air can be moved into the lobe.

3.2 Air pathway model from the trachea to alveoli in a single subacinus

Figure 3 indicates two air pathway models from the trachea to alveoli in two subacini in the right lower lobe at upright posture. The last respiratory bronchiole (RB) located at dorsal part is the 19th generation with 0.37 mm in diameter at TLC. The right half in Fig. 3 indicates magnified views of the subacinus. Alveoli are colored by path length from the end of the last RB (red alveoli are the most distant). All alveoli are connected to the trachea through branched alveolar duct. Regional alveolar wall motion is computed by superimposing macroscopic displacement of the whole lung on the mesoscopic motion of the alveolar system. The right-end pictures in Fig. 3 indicate horizontally thin-sectioned images with 0.25 mm in thickness, mimicking clinical X-ray CT images. Net-like patterns of the alveolar wall at FRC and TLC are apparently different because of the alveolar structural change. This change causes the change in tissue density, and hence, the change in CT value. Details of the inner structure of the subacinus will be explained later.

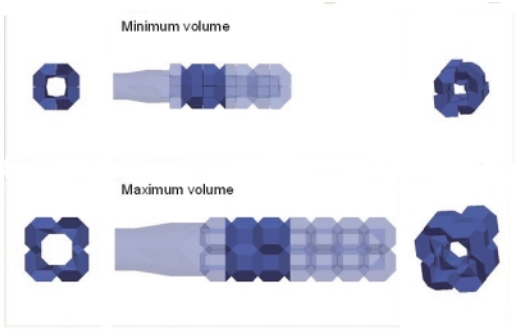

Fig. 4. A single duct unit in a straight alveolar duct model. Upper: at minimum volume. Lower: at maximum volume.

3.3 Straight alveolar duct model

Lung4Cer generates an alveolar system by connecting multiple alveolar duct units so as to make a branched space-