

## **Developing of Fast 3-Dimensional Labeling Algorithm Based on Raster Scanning Method**

### **Summary**

Recent advances of computed tomography (CT) and computer graphics (CG) enable us to re-construct the 3-dimensional images of the complicated objects, such as human body and engine block and so on, and to see the details of inside of the objects. As the obtained image data has only the color depth of each pixel or voxel, we have to recognize and distinguish individual parts of the object by looking and observing the image data carefully. However, if further numerical treatment, such as computer fluid dynamics and/or finite element structural analysis, is necessary, this process must be automated in order to avoid enormous human tasks. "Labeling" is such a technique to recognize and distinguish individual parts of the object. For 2-dimensional scanned pixel data, there are two popular methods that have been utilized so far, the label propagation method (LPM) and the raster scanning method (RSM). LPM is a method which finishes the labeling procedure by scanning individual parts repeatedly and the analysis time is effected by the size of image or the number and the size of individual parts and so on. While RSM is a method which can finish the labeling procedure by scanning a whole image object only two times using a label information table and the analysis time is only determined by the size of image object. To the best of the authors' knowledge, however, there are few researches related to the labeling technique for 3-dimensional scanned voxel data.

In this paper, a novel labeling technique for 3-dimensional scanned voxel data is proposed. The proposed technique is based on RSM and no "turning back" algorithm for gaining faster labeling speed. Finally, in order to demonstrate the potential of the proposed technique, several numerical experiments are conducted. As conclusion, the proposed method is up to 200 times faster than the conventional method based on LPM and the validity and the effectiveness of the proposed technique is clarified.

**keywords:** Labeling, Raster Scanning Method (RSM), Label Propagation Method (LPM)

