The segmentation process of lung vessels is shown in figure 1:

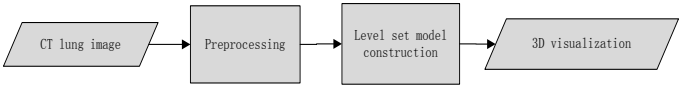


Figure 1. The flowchart of our algorithm

Preprocessing

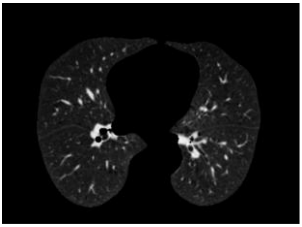


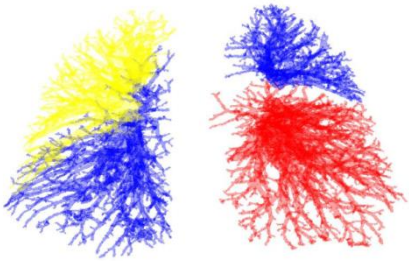
Figure 2. Image after preprocessing

The process begins with a logical AND operator bitwise is performed between the lung mask and the original lung images, in order to extract only the areas of interest (Figure 2).

Level Set model construction

Given the input CT scan, we introduce a local Chan–Vese (LCV) model, which mainly captures the boundaries with cusps and narrow topology structures, then the fractional differential-based vesselness is computed as the regularization term for LCV model. The regularization term improves the ability of capturing detailed information as the basis for driving the curve accurately with resist to intensity nonuniformity and small vessels.

3D Visualization



Discussion

The algorithm is fully automatic, no user intervention is needed. However, our approach has difficulties to exclude other abnormalities with high intensity values from the final segmentation, such as nodules and

airway walls.

[1] L. Wang, C. Li, Q. Sun, D. Xia, C. Kao, Active contours driven by local and global intensity fitting energy with application to brain MR image segmentation. Journal of Computerized Medical Imaging and Graohics 33 (7) (2009) 520–531.

[2] Chaobang GAO,Jiliu ZHOU, Xiuqing ZHENG, Fangnian LANG, Image Enhancement Based on Improved Fractional Differentiation. Journal of Computational Information Systems7(1) (2011) 257-264