**Automatic PCA-based lung lobe segmentation from CT scans**

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Human lungs are divided into five distinct anatomical regions, which are called the pulmonary lobes. The identification of these lobes is of great importance in applications of lung disease assessment and treatment planning. However, to find an effective and time-saving automatic lobe segmentation method is a challenging task because of anatomical variation and incomplete fissures. The current published lung lobe segmentation methods usually heavily rely on anatomic knowledge and largely ignore individual variability. This sometimes lead to a segmentation failure for some pathological lungs which have abnormal anatomic structures and fuzzy appearance of fissure locations.

In this study, we plan to use a statistical shape models (a PCA average model) to help with the lung lobe segmentation. Through deforming an average lobe model, we will be able to predict fissure locations approximately, specifying a ROI of fissure searching regions. Then, an eigenvalue of Hessian matrix analysis and connected component eigenvector based analysis were developed to get a set of fissure-like candidate points. A smooth multi-level B-spline curve was applied to fit the fissureness maximum points and extrapolate the fitted fissure plane to the lung boundaries. The visualization and user interaction such as parameter setting and manual correction were realized using an open source, pulmonary toolkit (PTK). The method was tested on 20 CT scans including both FRC and TLC healthy young subjects and old IPF pathological subjects with a thickness of 0.5-3.0mm. A quantitative evaluation showed that the automatic algorithm yielded an accuracy of 72.5% to 92.6% for healthy cases and an accuracy of 53.8% to 85.7% for pathological cases with strict 3mm evaluation criteria. The whole procedure gets rid of the dependence of other anatomical structures and provides a promising potential of automatic lobe segmentation procedure for clinical application.