**Pulmonary lobar segmentation from computed tomography scans based on a statistical finite element analysis of lobe shape**

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Automatic identification of pulmonary lobes from imaging is important in disease assessment and treatment planning. However, the lobar fissures can be difficult to detect automatically, as they are thin, usually of fuzzy appearance and incomplete. The fissures can also be obscured by or confused with features of disease, for example the tissue abnormalities that characterise fibrosis. Traditional anatomical knowledge-based methods rely heavily on anatomic knowledge and largely ignore individual variability, which may result in failure to segment pathological lungs. In this study, we aim to overcome difficulties in identifying pulmonary fissures by using a statistical finite element shape model of lobes to guide lobar segmentation. By deforming a principle component analysis based statistical shape model onto an individual’s lung shape, we predict the likely region of fissure locations, to initialize the search region for fissures. Then, an eigenvalue of Hessian matrix analysis and a connected component eigenvector based analysis are used to determine a set of fissure-like candidate points. A smooth multi-level β-spline curve is fitted to the most fissure-like points (those with high fissure probability) and the fitted fissure plane is extrapolated to the lung boundaries. The method was tested on 20 inspiratory and expiratory CT scans, and the results show that the algorithm performs well both in healthy young subjects and older subjects with fibrosis. The method was able to estimate the fissure location in 100% of cases, whereas two comparison segmentation softwares that use anatomy-based methods were unable to segment 7/20 and 9/20 subjects, respectively.