Content-based retrieval and analysis of HRCT images from patients with interstitial lung diseases

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Introduction

The interpretation of high-resolution computed tomography (HRCT) of the chest from patients with interstitial lung diseases (ILD) is often challenging with numerous differential diagnoses. We developed computer tools and created a database (126 cases representative of the 15 most frequent ILDs) to assist the radiologist in the diagnosis workup of ILDs.

Methods

Automatic detection and characterization of abnormal pulmonary tissue in HRCT images as well as retrieval of similar cases are implemented based on the visual information contained in the images along with a set of clinical parameters describing the clinical state of the patient. Similar cases are retrieved based on the volumes of abnormal tissues detected as well as subsets of clinical parameters.

Results

An automatic detection rate of 78% among fives type of lung tissue (including healthy) was obtained using a leave-one-patient-out cross validation of 70 image series from patients affected with ILDs. The recognition rate is obtained with an experimental setup that is faithfully similar to actual clinical situations.

Conclusion

Image-based diagnostic aid tools are available for evaluation to clinicians at the Emergency Radiology Service of the University Hospitals of Geneva. The automatic recognition of abnormal lung tissue provides a draft overview of the image series that constitutes a second opinion with reliability assessment. In addition, image-based retrieval of similar cases enables advanced browsing of large repositories of ILD cases. We plan to integrate content-based access to literature to retrieve state-of-the-art documentation associated with the HRCT image under investigations.