

## Computerized assistance for diagnosing interstitial lung diseases in emergency radiology

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### Abstracttext:

**Background:** The term interstitial lung disease (ILD) accounts for around 150 disorders of the lung tissue characterised by often unspecific symptoms. While conventional examinations along with chest x-rays are not always sufficient to solve ambiguities, high-resolution computed tomography (HRCT) of the chest can deliver more information. However, interpreting HRCT images represents a challenge even for trained chest radiologists and lung specialists. Moreover, the medical context determined by clinical parameters is fundamental for correct interpretation. In emergency radiology, the large diversity of modalities and organs encountered along with time constraints creates a need for computerised diagnostic assistance. In this study, we describe requirements and first results for image-based diagnostic aid for interstitial lung disease with clinical data integration.

**Methods:** The state of the art in image-based diagnostic aid was studied to identify challenges and solutions proposed. Clinical parameters associated with the 15 most frequent diseases were selected in collaboration with lung specialists and from current literature. A relational database was implemented in MySQL to start the collection of cases from the electronic patient record. In parallel, the annotation process of regions in the HRCT images to establish ground truth was carried out with a visual interface implemented in JAVA. Visual features were implemented in order to characterize the lung tissues patterns for classification.

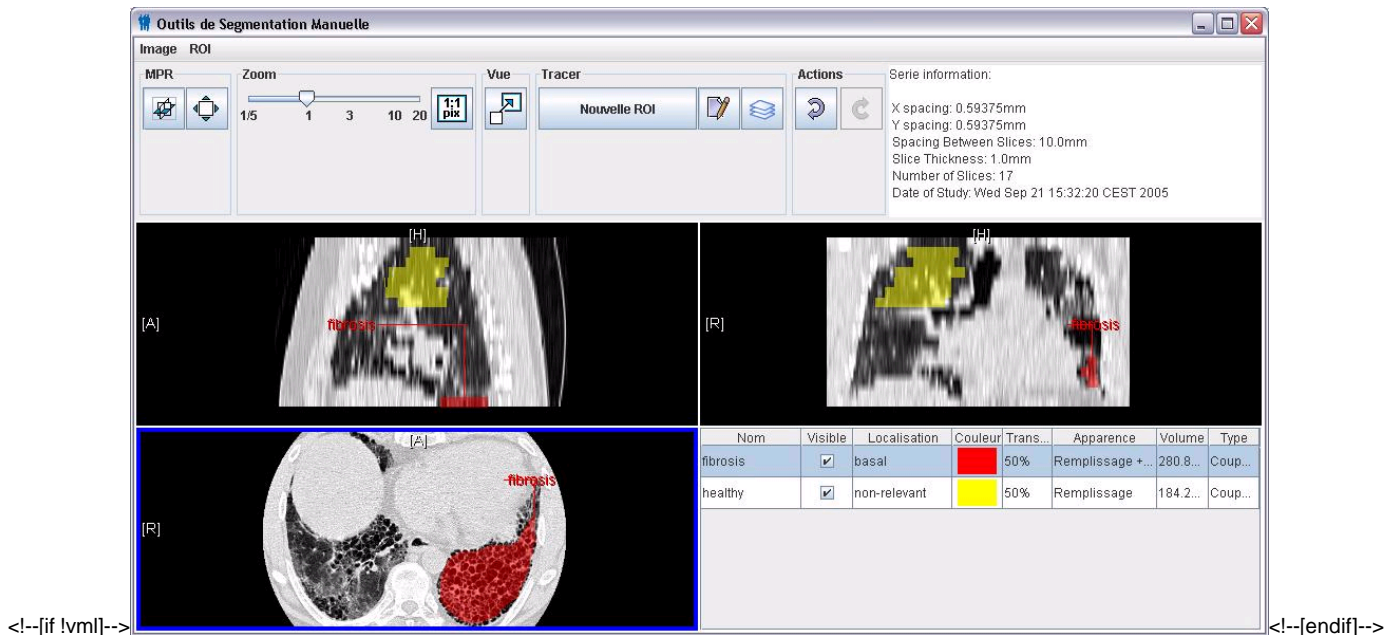


Figure 1: A screenshot of the annotation tool for lung regions.

**Results:** 99 clinical parameters were selected to characterize the ILDs. Existing in-house software was adapted to carry out three-dimensional annotations in full resolution DICOM images (see Figure 1). A file format was developed to save or load regions of interest (ROIs). Currently, 254 image series with certified diagnoses have been selected and 26 annotated. A multimedia database was built in MySQL to store annotated images along with clinical parameters of the ILD cases. Currently, 64 cases are detailed in the database. In order to study the composition of the lung tissue, grey-level histograms of the ROI were built. Features such as mean, kurtosis and percentage of air pixels were derived from the histograms and show good discriminative properties for the separation of lung tissue patterns.

**Conclusion:** A solid basis for building a computerized diagnostic aid for interstitial lung diseases is established. The data acquisition process of ILD cases is still in progress. However, an important need remains for a more specialized visual feature set to describe pathologic tissue patterns of the lung. A classification framework has to be developed and integrated into a visual interface highlighting abnormal regions to the emergency radiologists and to retrieve similar cases from the multimedia database based on visual properties and clinical data.