Purpose: Temporal subtraction images created from sequential chest radiographs provide a tool for the enhanced visualization of pathologic change. Although these images provide valuable information to radiologists, the presence of misregistration artifacts could confound the appreciation of actual pathologic change regions. The purpose of this study was to develop a method for the automated identification of pathologic change depicted on temporal subtraction images using a texture-based classification framework.

Methods: Eighty-eight temporal subtraction images derived from the posteroanterior chest radiographs of 49 patients were created using an existing temporal subtraction algorithm. With the corresponding computed tomography (CT) scan as a reference, an experienced radiologist manually outlined all regions of pathologic change on each subtraction image to provide the "truth." Generated with each subtraction image was a corresponding "lung mask" image that defined the spatial extent of the lung fields within the image. Candidate pathologic change regions were segmented within the lung mask using a gray-level thresholding technique, and morphological features computed for each region (e.g., area, circularity, perimeter) were used to reduce false positives. Texture features extracted from a 64x64-pixel region of interest (ROI) placed over the centroid of each remaining candidate within the subtraction image were input to an automated linear discriminant classifier, which was trained using the regions of actual change outlined by the radiologist. Performance was evaluated using receiver operating characteristic (ROC) analysis.

Results: A resubstitution classifier training/testing paradigm applied to the set of change region candidates yielded an area-under-the-ROC-curve value (Az) of 0.75. A 10-fold cross validation training/testing paradigm for evaluating "truth" regions yielded Az=0.88.

Conclusions: This study demonstrates the potential for texture features to distinguish regions of pathologic change from misregistration artifacts on temporal subtraction images of the chest. Future work will seek to improve the extraction of initial region candidates.

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