AbstractID: 1548 Title: Automated Analysis of Registration Accuracy in Temporally Subtracted Chest Radiographs

Radiologists routinely compare multiple chest radiographs acquired from the same patient over time to identify changes in anatomy and pathology. The registration of temporally sequential chest images to construct a “temporal subtraction image” is a powerful technique for the enhanced visualization of subtle change. We have developed a method for the automated assessment of registration accuracy as demonstrated in temporal subtraction images created from chest image pairs. Registration accuracy assessment is necessary since automated selection of the optimal comparison image from among multiple previous images is then possible. A “lung mask” region encompassing both lungs in the temporal subtraction image is automatically identified and divided into multiple overlapping regions of interest. 112 features are computed for the lung mask region as a whole and for the individual regions of interest. These features include gray-level histogram-based features such as mean, kurtosis, and skew and texture measures such as fractal dimension, first moment of the power spectrum, and RMS variation. Stepwise linear discriminant analysis selected the 20 most discriminating of these features. An experienced chest radiologist assessed the registration accuracy of 143 temporal subtraction images from 36 patients using a 5-point scale ranging from “5-excellent” to “1-poor.” In a consistency evaluation of the registration accuracy of these temporal subtraction images, the automated method distinguished between images that had been rated 1 or 2 from images rated as 3, 4, or 5 with high accuracy, yielding an area under the ROC curve of 0.92.
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