

## Computer-aided diagnostic scheme for pulmonary nodule detection using a contralateral subtraction technique

A computer-aided diagnostic (CAD) scheme is being developed to assist radiologists in the detection of pulmonary nodules in chest radiographs. A problem in the current scheme is its high false positive rate, due to ribs and rib crossings. In this study, we used a novel contralateral subtraction technique, by which symmetric skeletal structures such as ribs can be eliminated, to reduce false positives. With our CAD scheme, a chest image is first enhanced using a difference image technique, in order to select initial nodule candidates. A rule-based technique and an ANN method are applied to eliminate some false positives based on various image features. Our CAD scheme can achieve 70% sensitivity at a false positive rate of 1.7 per image. To further remove false positives, a contralateral subtraction image is obtained by subtraction of a right/left reversed "mirror" image from the original chest image. The contrast and relative standard deviation are determined at the corresponding locations of nodule candidates in the subtraction image, to distinguish between nodules and false positives. In a pilot study, the CAD scheme was applied to 10 chest radiographs, with 10 detected nodules and 14 false positives. By examining two features from the contralateral subtraction images, thirteen false positives were eliminated without a reduction in true positives. Therefore, the contralateral subtraction technique can significantly improve the performance of the nodule detection scheme.