

Performance Evaluation of an Automated Microcalcification Detection System

We have developed a computerized system to assist radiologists in detection of microcalcifications on mammograms. An input mammogram is digitized by a high-resolution laser scanner. A breast segmentation program detects the breast area on the mammogram. Microcalcification detection is performed only within the breast area. The image is first processed with a difference-image technique which subtracts a signal-suppressed image from a signal-enhanced image to remove the structured background. Potential signal sites are identified on the difference image by global thresholding. An adaptive thresholding technique is then used to segment the signals based on the local signal-to-noise ratios (SNR). Morphological features are extracted from the signals that pass the chosen SNR threshold. False-positives are subsequently reduced by using the morphological characteristics of microcalcifications. The remaining signals are further examined by a convolution neural network that has been trained to distinguish true and false microcalcifications. Finally, a clustering technique is used to detect clusters that contain three or more microcalcifications within a 1-cm diameter area on the image.

We are conducting a pre-clinical evaluation of the performance of the detection system. Mammograms that have not been used for training the detection system are used. In our preliminary study, 143 mammograms were processed. At the chosen SNR threshold, the detection sensitivity was approximately 85% at a false-positive rate of 0.7 clusters per image. The evaluation of the system will continue with a larger data set and the results will be presented.