AbstractID: 3886 Title: : Computer-aided diagnosis: computerized classification of malignant and benign microcalcifications on full field digital mammograms

Purpose:
To develop a computer-aided diagnosis (CAD) system for characterization of malignant and benign microcalcifications on mammograms acquired with a full field digital mammography (FFDM) system.

Method and Materials:
Our computerized classification system uses raw digital mammograms as input. The individual microcalcifications are first segmented by the system from the mammographic breast tissue background. Five morphological features describing the size, the density, and the shape of the individual microcalcifications are extracted. The mean and the variation of each of these features for the individual microcalcifications within a cluster are calculated. These cluster features in combination with the number of microcalcifications in a cluster form the morphological feature space. For texture feature extraction, a region of interest (ROI) containing the cluster of microcalcifications is identified on the mammogram. Background correction is applied to the ROI to reduce the intensity variation in the breast tissue areas. Texture features including the mean, entropy, contrast, and angular second moment are extracted from the gray level dependence difference statistics of the background-corrected ROIs in four directions. A leave-one-case-out resampling scheme is used to train and test the linear discriminant classifier. The most effective features from the combined morphological and texture feature space are identified using stepwise feature selection with simplex optimization in each training cycle. The performance of the classifier is evaluated by receiver operating characteristic (ROC) analysis.

Results:
In a preliminary study using digitized mammograms, the computer classifier obtained an area under the ROC curve, A_z, of 0.82 ± 0.03 for testing. The performance of the CAD system using a data set of 100 cases of biopsy-proven microcalcifications on FFDMs will be presented.

Conclusion:
A trained CAD system can provide an estimate of the likelihood of malignancy of microcalcification on mammograms and thus may be used as a second opinion by radiologists for mammographic interpretation.