

AbstractID: 3079 Title: Investigation of Various Methods for Determination of Similarity Measures for Pairs of Clustered Microcalcifications on Mammograms

Purpose: Presentation of images similar to an unknown lesion on mammograms may be useful to radiologists in their image interpretation. The purpose of this study is to investigate different methods for determination of similarity measures that would agree with radiologists' subjective similarity ratings.

Method and Materials: We used 881 ROIs that included clustered microcalcifications. We selected 19 "unknown" images each of which was compared with six "known" images to produce 114 pairs. Nine breast radiologists provided similarity ratings based on the overall impression for diagnosis for the 114 pairs. Subjective ratings were marked on a continuous rating scale between 0 and 1, where 0 and 1 correspond to two lesions not similar at all and almost identical, respectively. A number of image features were extracted from the lesions for determination of similarity measures. Two similarity measures were determined by use of the Euclidean distance without and with unique strong features of an unknown image. A psychophysical similarity measure was determined by use of an ANN that can learn the relationship between radiologists' similarity ratings and feature values. The correlation values between the subjective ratings and the similarity measures were determined to evaluate the usefulness of similarity measures.

Results: The Euclidean-distance-based measure with unique features provided the improved correlation values for four cases, but degraded correlation values for three cases, compared with that without unique features. When ANN was employed, the correlation coefficients were further improved by use of a leave-one-out test method.

Conclusion: Simple similarity measures such as those based on the Euclidean distance would not be a reliable measure. The selection of features for a specific unknown case and the use of ANN have the potential to improve the determination of reliable similarity measures.

Conflict of Interest: RAS and KD: shareholders, R2 Technology Inc.; KD: shareholder, Deus Technology Inc.