

A QUANTITATIVE METHOD FOR EVALUATING IMAGE PROCESSING ALGORITHMS FOR
DIGITAL MAMMOGRAPHY IN TERMS OF THEIR VISUALISATION OF
MICROCALCIFICATIONS

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Microcalcifications, simulated with a previously validated method, have been used for the creation of composite image with a known number of lesions and various shapes. These datasets are a useful tool for observer performance studies. Present study uses this approach to set-up a quantitative method for evaluating image processing algorithms in terms of the visualisation of microcalcification.

For the creation of a basic data set of composite images, 420 microcalcifications with various morphology, size and contrast were inserted in 59 selected raw digital mammograms from Siemens Novation DR. The microcalcifications were simulated into 163 ROIs, having various anatomical backgrounds. These composite images were reprocessed with the Siemens processing algorithm. Experienced radiologists from the Sentinel project team were asked to locate as many simulated lesions as possible and rate them under conditions of free-search. The modified receiver operating characteristic study FROC has been performed for comparison of observer performance in function of lesion characteristics and of anatomical background. Statistical analysis of FROC data will be performed by the JAFROC 2.0 software.

The main advantage of this methodology is that the exact number of inserted microcalcifications is well known and that the lesions are fully characterized in terms of size, morphology and peak contrast. This approach leads to quantitative data for microcalcification visibility and detectability in digital mammography. For the Siemens processing, we established reference curves.

Preliminary finding in this study indicate that this method can be used to evaluate and compare clinical processing protocols for microcalcifications detection. The presented method may be a first step towards a standard for testing processing algorithms.

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