

AbstractID: 3792 Title: The differences method for the tissue structured noise determination in digital mammography

Purpose: To propose a new method for the estimation of the tissue structured noise, based on the differences distributions among neighboring pixels.

Method and materials: Breast tissue structured noise (σ_T) is determined as the difference between the total and system noise. The system noise (σ_{SYS}), which includes quantum and apparatus noise, is determined using digital mammography images without an object. The total noise is obtained from the differences distributions among neighboring pixels in the region where the compressed breast thickness is constant. The range of raw pixel values is split into intervals to suppress the quantum noise variation contribution and σ_T is determined for each interval. 280 Senographe 2000D clinical images from 100 unselected patients were collected and analyzed. Also based on the differences distributions for a flat phantom, we propose a method to estimate spatial resolution for pixelized detectors.

Results: The average measured value of σ_T / σ_{SYS} is 0.45 ± 0.15 for the 10 cycles/mm frequency and for all the pixel value intervals. The absolute value of σ_T for the same frequency is estimated to be 1.7 ± 1.0 microns in microcalcification thickness equivalent. The σ_T is also determined down to 1 cycle/mm frequency. The estimated Senographe 2000D spatial resolution is approximately 60 microns.

Conclusions: The proposed method for σ_T and resolution estimation is very simple and fast enough to use in online image processing, not requiring a complex signal/background analysis. The main limitation of the method for low frequencies (less than 1 cycle/mm) is statistical.