AbstractID: 7012 Title: Towards a modality-independent image processing workstation for digital mammography

Purpose: To measure the characteristic curve response of the raw, “for processing” digitized screen-film and digital detectors to variations in incident exposure for mammography applications. Conversion and transformation of digital data to values directly proportional to exposure normalizes the output independent of the detector response to allow a “universal” workstation to render DICOM “for presentation” images of similar appearance.

Method and Materials: Screen-film response was measured by varying tube current under tight collimation with a 4.5 cm plastic attenuator in a scatter-free geometry. Multiple exposures on a film were achieved by repositioning the cassette under the collimated area and recording the incident exposure with a calibrated radiation dosimeter, which ranged from ~1 mR to ~40 mR over 11 exposures. Film processing and digitization provided DICOM images. Region of interest analysis on the exposed film areas yielded average value as a function of exposure. A look up table (LUT) was constructed by fitting the curve with a third-order polynomial, and scaling the output to a range of 4000. Application of the digital number to exposure LUT on the digitized films produced “exposure normalized” images. A similar technique was used with a prototype CR mammography system to discern the digital number to exposure relationship, using an exponential fit for the LUT transform to provide exposure normalized CR images.

Results: Transformation of digitized screen-film calibration images was achieved with good fidelity; likewise, CR conversion was achieved with excellent linearity. Subsequent processing enhancement of normalized images yielded good appearance matching compared to the original “for presentation” film and CR images.

Conclusion: Digitized mammography films and CR mammography images transformed to a linear exposure response can yield similar DICOM “for presentation” appearance with independent image processing, important for longitudinal comparisons by the radiologist.

Conflict of Interest (only if applicable):
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