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An Iterative Method for Flat Field Correction in Digital Radiography Detector

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The Purpose of this study is to investigated the effect of X-ray tube positions with respect to detector on the non-uniformity correction, and propose a method to reduce the effect using a new algorithm with computer simulation. Gain images that represented the reference image used to execute the flat field correction were taken in two SIDs (Source to Image-receptor Distance). Pixel values at second SID was calculated using the pixel values at first SID, the assumed gain coefficient, and the formula based on the solid angle of each detector pixel facing to the x-ray source. Gain coefficient was adjusted using the difference between calculated and real pixel values at second SID. Calculation was repeated with new gain coefficient until the gain coefficient was converged into prescribed range. Flat field correction could be performed using acquired gain image. Non-uniformity of blank x-ray images taken with the detector tilted by 0 to 45 degrees was corrected and five ROIs across the image were defined and analyzed. With a blank image obtained with the detector tilting angle of 45 degrees the lowest ROI mean value was 53% less than the highest ROI mean value when usual non-uniformity correction was performed. When the proposed was used for the flat field correction, however, the lowest ROI mean value was only 7% less than the highest ROI mean value, and standard deviations of pixel values in the ROIs were reduce to 10% of the cases of usual flat field correction. Because of the characteristic of usual flat field correction, non-uniformity in detector that was not aligned to the X-ray source considerably increased. We also calculated the gain coefficient and performed the flat field correction with the iterative method in the tilted or arbitrary detector position. The proposed algorithm gave a satisfactory uniformity.

Keywords : X-Ray, Flat Field Correction, Digital Radiography