AbstractID: 5770 Title: A Practical DRR Reconstruction Technique for Removing Artifact Induced by Patient Respiration for Prostate Cancer Treated with IMRT

Purpose: In our clinical practice, we often encounter prostate cancer patients who breathe heavily during CT simulation. This is particularly significant for overweight patients. Consequently, the DRRs reconstructed from these CT images show a sine wave type of artifact on the femoral and pelvic bones. This phenomenon is especially pronounced in the right and left lateral views, where the respiration amplitude is maximum, making patient setup verification based on these DRRs very difficult. In this study, we attempted to develop a practical reconstruction technique to remove this artifact efficiently.

Materials and Method: A right lateral DRR was first computed using the acquired CT images. A sine wave function with proper amplitude and phase was used to model the breathing pattern as shown on the femoral bone on this DRR. This would allow us to determine the breathing amplitudes of each individual slices relative to the mean breathing position during a complete respiration cycle. The correct shift (or number of rows) of each slice relative to the mean breathing position was then determined by dividing the breathing amplitude by the pixel resolution. For each slice, the data matrix was resorted by shifting the matrix by the number of rows determined in the last step. The missing top rows (in the case of downward shifting) or bottom rows (in the case of upward shifting) were filled in with data from the nearest row. The new DRRs will then be computed from these resorted CT data. The proposed technique was implemented using MATLAB.

Results: Comparison of original DRRs and the DRRs computed using proposed technique showed significant reduction in breathing artifact. The quality of these new DRRs was sufficient for patient setup verification.

Conclusions: The proposed technique is practical and can effectively remove the sine wave artifact induced by respiration.