AbstractID: 1249 Title: A Technique for Non-Invasive Respiratory Gated Radiation Treatment System Based On a Real Time 3D Ultrasound Image Correlation

We have proposed a new respiratory gated radiation treatment system that allows real-time tumor localization while avoiding invasive operation to a patient. The proposed system employs a 3D ultrasound device, a 3D digital localizer, and a real-time image processing system. At the planning time, CT and 3D ultrasound reference data are simultaneously acquired under a breath-hold condition. At the treatment time, ultrasound data on three orthogonal planes are acquired and transferred to the image processing system on a real-time basis. Subsequently, normalized image correlation indices using the reference and the real-time ultrasound data are calculated for the three orthogonal planes after performing real-time coordinate transform using the 3D digital localizer attached to an ultrasound probe. Prior to the system execution, the coordinate transform matrices are partially calculated using an ultrasound calibration phantom and the 3D digital localizer. A trigger pulse to a linac can be generated when the normalized image correlation index exceeds a predetermined threshold level. Experiments have been carried out using a moving-target phantom that simulates a patient respiratory motion. We have observed that the variation of the calculated real-time correlation index synchronizes with the periodical motion of the moving-target, suggesting that real-time localization for a moving tumor is feasible with the proposed system.