AbstractID: 11216 Title: Simultaneous Amplitude Monitoring for a Phase-Based External Surrogate System by using Stereo Cameras in Respiratory Gated Radiation Treatment

Purpose: A patient's amplitude of respiratory motion cannot be monitored simultaneously in phase-based respiratory gated radiation treatment (RGRT) using RPM (Real-time Position Management System, Varian). A novel method was developed to independently monitor amplitude of a phase based RGRT patient by using a stereo camera system. **Method and Materials:** A phantom oscillated regularly with an amplitude of 3.5 cm in anterior-posterior direction and a respiratory period of 7.3 sec. Ten phase image sets of the motion phantom were acquired from a 4D-CT scanner equipped with an external surrogate marker. Sagittal DRRs were reconstructed to register external contour of the phantom in an order of phases. A stereo camera system of two CCD cameras and a line laser marker were synchronized with the RPM system and then acquired amplitude information of the phantom in a treatment room. The amplitude of the phantom monitored by the stereo camera system was compared in real-time with the pre-registered body contour of the sagittal DRRs. **Results:** The customized stereo camera system with an aid of a developed computer program calculated phantom amplitudes in a rate of 0.22 sec/frame. The motion of the phantom was displayed in real-time with sagittal DRRs of corresponding respiratory phase. During four respiratory cycles, the average difference between monitored and pre-registered amplitude in 8 cm length' ROI was 0.30 ±0.16 cm. **Conclusion:** The developed stereo camera system that provides amplitude information can effectively monitor phase based respiration gated treatment in real time.