AbstractID: 3422 Title: Using CT Cine Data as an Alternative Method for Respiratory Phase Analysis and a Potential Method for Tumor Motion Study

Purpose: To demonstrate the use of cine images from 4D-CT imaging as an alternative method to obtain respiratory signal for sorting of the 4D-CT data, and as a tool to understand the relationship between the externally measured respiratory signal and the internal tumor motion.

Method and Materials: Six lung patients were scanned in the tumor region with coverage of approximately 8 cm. The respiratory trace for each patient was clinically acquired using the RPM system placing the RPM block near the diaphragm. The cine images were used as an alternative method to obtain respiratory signal by measuring CT density variation versus time in a region of interest chosen at the boundary of tissues with high CT density contrast. We also placed a region of interest to measure the CT number changes as a way to describe the tumor motion in either superior-inferior or anterior-posterior direction. We compared the respiratory signal from RPM and the respiratory signal from cine images and correlated the two respiratory signals with the internal tumor motion (also from cine images).

Results: Images can be sorted to become 4D-CT data using the respiratory signal measured from cine images. When compared to the RPM signal, the respiratory traces measured using the cine images, showed phase differences ranging from 2% to 25%. Tumor motions observed using the cine data for three patients showed 50% phase difference in S-I direction and 0% and 25% phase differences in A-P direction from the respiratory signal of the RPM block.

Conclusion: We have demonstrated that cine data can be used as an alternative way of acquiring respiratory waveform for 4DCT images registration. The tumor motion can also be studied using the cine data. The 4D-CT data can also help us understand the relationship between internal tumor motion and the externally measured respiratory signal.