AbstractID: 5202 Title: Derivation of the tumor position from external respiratory surrogates with periodical updating of external/internal correlation

Purpose: To develop techniques that can derive the tumor position from external respiratory surrogates through periodically updated internal/external correlation.

Method and Materials: A simple linear function is used to express the correlation between tumor and surrogate motion. The function parameters are established during patient setup session with both tumor and surrogate positions measured at 30Hz rate. During treatment, the surrogate position, constantly acquired at 30Hz, is used to derive the tumor position. Occasionally, a tumor image is acquired to enable the updating of the correlation function. Four update methods are investigated. (a) Line shift. (b) Fit model - through point. (c) Fit model - extra weight. (d) Function difference - fit point.

Results: Tumor and external surrogate motion demonstrates a high degree of correlation however it dynamically changes over time. Occasionally updating the correlation function leads to more accurate predictions than using external surrogates alone. At the lowest tumor imaging rate tested in this work (0.1Hz) an accuracy improvement of 10% over the prediction by the mere use of external surrogate was observed for the best update method. Update methods (a) and (b) derive the tumor position with larger accuracy than (c) and (d) in case of high imaging rates. The opposite is observed in case of low imaging rates.

Conclusion: Occasional calibration of the tumor/external surrogate correlation during treatment substantially increases the accuracy of the tumor localization compared to tumor position derivation by using the external surrogate alone.