AbstractID: 9656 Title: Prediction of fiducial motion in respiratory tumors for Image-Guided Radiotherapy.

Purpose: Several groups have investigated monitoring respiratory tumor motion during a radiotherapy treatment session by fluoroscopically tracking implanted markers. However tracking requires prediction because there is a mechanical latency involved in either shutting the beam off or moving the position of the beam to adjust for the tracking results. Investigators have examined predicting respiratory tumor motion using various linear, non-linear, and adaptive techniques. Here, we run a pilot study and try a new non-linear regression method for prediction and compare it with linear prediction on three patients with respiratory tumors.

Method and Materials: We examine two methods to predict the future location of the tumor, moving linear regression and moving support vector regression. By trial and error, we find that using 8 prior locations of the tumor is optimal for the linear model. The support vector regressor is non-linear because we use a radial basis kernel function to expand the input space. Like the linear model, it also uses 8 prior locations to predict the future location.. The loss function is the ε-insenstive. We test our models on data from 3 patients with respiratory tumors. The motion data was collected with Accuray's Synchrony system at 30Hz.

AbstractID: 9656 Title: Prediction of fiducial motion in respiratory tumors for Image-Guided Radiotherapy.

Results: We predict the location of the tumor 1 second ahead. The root mean square error of no prediction, linear regression, and support vector regression respectively is 7.41 mm, 1.93 mm, and 1.47 mm.

Conclusion: On this small set of patients, we appear to predict tumor motion further into the future than previously reported. Although this might be because of the small sample size, what remains significant either way is the fact that support vector regression out-performed the linear method for predicting tumor location for each of the three patients.