

AbstractID: 13256 Title: Variation estimation of parotids - towards more accurate image guided adaptive radiation therapy of h&n cancers

Purpose: Patient anatomical variation identification and treatment dose estimation are the main feedbacks in image guided adaptive radiation therapy (IGART) process. The identification/estimation can be updated during the treatment course with using online treatment observations obtained from onboard CBCT imaging. In this study, we modeled the geometric variation of parotids using a nonstationary stochastic process and utilized the time-varying least-square method to estimate the characteristics of the variation.

Method and Materials: An estimation process with the time-varying least-square method was used to predict nonstationary stochastic organ variation and applied to evaluate the variation of parotids for 30 h&n cancer patients. The variations observed during the previous treatment days were used to predict those of the remaining treatment. The recursive least-square polynomial regression with exponential forgetting factor was employed to predict the mean and deviation of parotid positions. The order of polynomial and the forgetting factor were optimized based on the total estimation errors.

Results: The optimized order of polynomial was zero and the optimized forgetting factor was 0.74 for the mean position estimation. The corresponding averaged total error of all patients was 1.27mm. The optimized factor for the deviation estimation was 0.94 and the corresponding averaged error was 1.27mm. The estimation errors were approximately isotropic. The predicted results were not sensitive to the patient pool.

Conclusion: The developed procedure has been successfully applied to the prediction of the parotid variation. The predicted mean position was closer to the true mean position than the initial position by a factor of 2. Since the estimation process does not utilize any special features of parotids it can be applied to other organs.

Conflict of Interest: Supported by Elekta Oncology System, Inc