AbstractID: 14191 Title: Knowledge-based IMRT Treatment Planning for Prostate Cancer

Purpose: To investigate the potential of utilizing a knowledge-base of clinically approved plans to develop semi-automated IMRT treatment plans for prostate cancer. **Method and Materials:** We assembled a database of 100 prostate IMRT treatment plans and developed an information-theoretic system using mutual information to identify the similar cases by matching 2D beam's eye view (BEV) projections of contours. Ten randomly selected query cases were each matched with the most similar case from the database. Treatment parameters from the matched case, including beam geometry, fluences, and optimization criteria were used to develop ten new treatment plans. A comparison of the differences in dose-volume histograms (DVH) between the new and the original treatment plans were analyzed. Specifically, we consider PTV coverage and dose to 20%, 30%, and 50% of the critical structure volumes (D20, D30, D50). **Results:** PTV coverage for the ten cases are clinically acceptable; the average volume receiving 98% of the dose, V98, for the original plans is 99.8% versus 99.4% for the new plans. For the bladder, the percentage differences between the original and new plans (mean ± standard deviation) for D20, D30 and D50 are -3.4% ± 14.0%, -8.6% ± 19.1% and -16.7%± 34.3%. For the rectum, these values are 4.5% ± 13.7%, 1.7% ± 20.3% and -5.4% ± 36.6%. Negative value indicates an improvement (i.e. a dose reduction to critical structures). For most cases, the rectum and bladder doses are lower with the semi-automated plan. **Conclusion:** We demonstrate a knowledge-based approach of using prior clinically approved treatment plans to generate clinically acceptable treatment plans of high quality. This semi-automated approach has the potential to improve the efficiency of the treatment planning process while ensuring that high quality plans are developed.