

AbstractID: 6948 Title: Evaluation of Treatment Planning Time Savings using Direct Machine Parameter Optimization

Purpose: The purpose of this study is to evaluate the capability for increasing treatment-planning throughput by utilizing Direct Machine Parameter Optimization (*DMPO*). Traditional inverse treatment planning consists of an optimization phase followed by a separate leaf-sequencing phase. With DMPO based optimization, there is no leaf-sequencing step. As such, the treatment planning time for each IMRT case can potentially be decreased and treatment-planning throughput could be increased.

Method and Materials: Ten patients (*5 prostate and 5 head & neck*) were randomly selected for a comparative treatment planning study. IMRT treatment plans were created using the standard IMRT optimization algorithm with k-mean clustering based leaf-sequencing. A second treatment plan was created for each patient using the DMPO optimization algorithm. The only difference between the two plans for each patient was the optimization algorithm. For each case, the time required to optimize the plans, the number of segments required for step-and-shoot delivery, and total monitor units were recorded.

Results: Both the DMPO and IMRT optimizations yielded similar dose distributions. The mean time to perform inverse planning and leaf sequencing for prostate patients was 8.00 minutes, versus 8.85 minutes for DMPO based optimization. In contrast, the efficiency of DMPO for Head & Neck cases is substantially different. The mean time to perform a DMPO optimization for Head & Neck cases was 12.05 minutes, as compared with 28.63 minutes for IMRT optimization.

Conclusion: Over 16 minutes of treatment planning time can be saved per patient by utilizing the DMPO based optimization in Pinnacle for Head & Neck treatment planning. The time advantage can grow to hours saved per patient if multiple treatment plans are created, or if the planners aggressively adjust the plan. Depending on the Head & Neck volumes treated, DMPO optimization can increase treatment planning efficiency.