

AbstractID: 8970 Title: Decreasing IMRT delivery time by accounting for secondary jaw movement

## **Decreasing IMRT delivery time by accounting for secondary jaw movement**

### **Abstract**

**Purpose:** With direct aperture optimization (DAO), the process of leaf sequencing can be completely removed from the optimization process for intensity modulated radiation therapy (IMRT). However, a sequencing algorithm is still needed to efficiently deliver a series of DAO apertures or segments. This study investigates the effect of optimizing the delivery order of DAO segments on the delivery time of IMRT treatments.

**Materials and Methods:** Six clinical IMRT plans for head and neck cancer and six plans for treatment of prostate cancer with concurrent lymph node boost were used in this study. Two computer programs were written to find the delivery order for DAO segments which minimized the time required to move MLC leaves and secondary jaws. The first used an exhaustive search to find the optimum sequence, while the second used an evolutionary algorithm. The theoretical improvement in delivery time was determined for each plan using jaw and MLC leaf speeds of 1.5 cm/s and 2.0 cm/s, respectively. The actual change in delivery times were measured by delivering the plans to a phantom.

**Results:** The collimator movement time decreased by  $60 \pm 19$  seconds ( $22 \pm 6\%$ ) and  $19 \pm 5$  seconds ( $10 \pm 2\%$ ) for head and neck cancer and prostate cancer cases, respectively. The expected time savings increases for slower moving jaws. Time savings are greater for plans with more segments and/or larger field sizes. For beams with nine or fewer segments, the evolutionary algorithm converged to the global optimum 99% of the time.

**Conclusions:** Properly accounting for secondary jaw motion in the leaf sequencing algorithm can decrease the delivery time required for IMRT.