

AbstractID: 10859 Title: A New Patient Scheduling Approach for Proton Therapy Treatment Delivery

Purpose: To develop a patient scheduling system for treatment delivery at the University of Florida Proton Therapy Institute (UFPTI) such that patients' time preferences are satisfied to the largest extent possible, operational and technical restrictions are met, and at the same time efficient utilization of the facility is guaranteed. **Method and Materials:** A new modeling approach has been proposed in which so-called restricted and desired time windows are defined for each patient based on the operational restrictions and his/her time preferences, respectively. A treatment schedule is decomposed into two components; (i) sequence and (ii) timing, so that given a certain sequence of patients an associated optimal timing can be determined with respect to the restricted and desired time windows. In order to maintain stability in the treatment schedule, a common order in which patients are treated, a so-called union sequence is defined for the entire planning horizon. On the solution side, an exact algorithm, the so-called timing optimizer, is proposed to find the optimal timing given the sequence. Furthermore, a local search heuristic, which employs the timing optimizer to evaluate the quality of a sequence, is developed to obtain high-quality sequences with respect to three evaluation criteria defined to measure the desirability of a schedule. **Results:** The patient scheduling approach has been implemented and it is currently under clinical testing at the UFPTI. The experiments show that the proposed system can find high-quality schedules within a minute. **Conclusion:** This work presents a new heuristic approach to patients scheduling for treatment delivery. Patient scheduling at the UFPTI was formerly done manually in a time-consuming process; with the help of the new developed algorithm it is now possible to produce high-quality schedules in real time.