AbstractID: 8299 Title: Recent progress in IMRT inverse treatment planning

Radiation treatment planning requires the calculation of a set of parameters for the delivery of a certain radiation dose to the patient. Inverse planning, in which a set of optimized beam parameters is derived under the guidance of an objective function, becomes necessary for intensity modulated radiation therapy (IMRT) because of the vast number of system variables involved in the problem. While conceptually straightforward, there are several deficiencies in currently available inverse planning algorithms that make clinical IMRT planning intractable. Given a patient, the plan obtained can vary widely from one planer to the next even within a department and the IMRT treatment plans used for patient treatments are often sub-optimal. In this talk, I will discuss the bottle-neck issues that deteriorate the performance of the current inverse planning algorithms and summarize our recent work on the subject. Specifically, we will describe an effective IMRT dose shaping tool using a local penalty scheme, a beam eye's-view dosemetrics (BEVD) for assisting IMRT beam orientation selection, a mechanism for incorporating *a priori* knowledge into inverse planning and beam orientation optimization, and a general statistical analysis based inverse planning formalism. With these new tools, it is now possible to obtain improved IMRT plans with significantly reduced effort. Educational objectives of this talk include:

- (1) Describe inverse planning method and clinical IMRT procedure.
- (2) Discuss various practical problems associated with current inverse planning techniques.
- (3) Present a novel method for fine-tuning IMRT dose distributions using voxel-dependent importance factors.
- (4) Outline BEVD and BEVD-guided beam orientation optimization process for IMRT.
- (5) Introduce the statistical analysis based inverse planning framework and summarize its utility.