

AbstractID: 1468 Title: On the equivalence of multi-criteria fluence map optimization problems

We establish a unifying framework for the study of treatment plan evaluation criteria when used to formulate a multi-criteria optimization problem for fluence map optimization (FMO) in intensity modulated radiation therapy (IMRT). We use this framework to show that many criteria that have previously been thought to be unique are in fact equivalent in a multi-criteria optimization setting. These criteria include tumor control probability, normal tissue complication probability, probability of uncomplicated tumor control, as well as (generalized) equivalent uniform dose and sigmoidal transformations thereof. In particular, we show that models employing these criteria are equivalent to models formulated in terms of (generalized) equivalent uniform dose criteria only. In addition, we show that these models are also equivalent to models using voxel-based criteria that penalize dose in individual voxels. The unifying framework can be employed to determine, when pursuing new treatment plan evaluation criteria, whether these criteria indeed yield different sets of efficient treatment plans and therefore truly new models.