

عنوان مقاله:

Optimization of Beam Orientation and Weight in Radiotherapy Treatment Planning using a Genetic Algorithm

محل انتشار:

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خلاصه مقاله:

Introduction: The selection of suitable beam angles and weights in external-beam radiotherapy is at present generally based upon the experience of the planner. Therefore, automated selection of beam angles and weights in forward-planned radiotherapy will be beneficial. **Material and Methods:** In this work, an efficient method is presented within the MATLAB environment to investigate how to improve the dose distributions by selecting suitable coplanar beam angles and weights for the beam. In the beam angle and weight selection algorithm, the optimal beam angles and weights correspond to the lowest objective function value of the dose distributions of each group of candidate beams. Optimal weights and angles reach a balance between all the objectives. In this work, we used a genetic algorithm and adopted a real-number encoding method to represent both beam weights and angles with an assignable number of repetitions. For the evolution of this algorithm, we used both monophasic and biphasic methods. In monophasic evolution, the chromosome containing the weights and angles is evolved in a single phase. In biphasic evolution, the chromosome is evolved while keeping one parameter (e.g., weight) constant and then, in the second phase, the evolution is continued while keeping the other parameter (e.g., angle) constant. The dose calculation was carried out using correction-based techniques. **Result:** Simple and simulated clinical cases are presented to test the algorithm. They show that the biphasic evolution requires more computation time compared to monophasic (typically 40 and 20 minutes respectively) but results in a better optimization. **Conclusion:** The results show the efficacy of the algorithm and its fairly acceptable computation time.

کلمات کلیدی:

Genetic Algorithm, Treatment Planning, Dose Distribution, MATLAB Software

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