

Optimization of intensity-modulated radiotherapy plans using adjoint sensitivity analysis ¹

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In modern techniques of radiotherapy like intensity-modulated radiation therapy (IMRT) in which the radiation dose may vary in space and time the treatment planning is done by using sophisticated optimization algorithms.

In this work we proposed a novel method of IMRT optimization based on the concept of the adjoint sensitivity analysis. We use mathematical model of tumor growth with added term describing the effects of irradiation [1] to simulate the tumor behaviour during radiotherapy. The pre-defined functional characterizing the model's solution is minimized by using gradient-descent algorithm with additional constraints. The gradient for the minimization algorithm is calculated efficiently by using the concept of adjoint sensitivity analysis [2]. The results show the importance of value of the environment capacity for tumor cells which is consistent with recent research [3].

References

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