

Abstract

The goal of radiotherapy treatment planning (RTP) is to deliver with a high degree of spatial accuracy a large radiation dose to target volumes to sterilize all tumor cells with minimal damage to normal tissue and organs concurrently. Computer-aided optimization of RTP started in the middle of 1960s with the works of Hope et al. Since then great efforts have been made in all aspects of treatment planning and remarkable progress achieved. 2-D RTP has evolved into 3-D RTP and 'trial-and-error' planning into almost automatic computer-aided planning.

A neural network (NN) model for linear programming is proposed to optimize radiotherapy treatment plan in this paper. Comparing with traditional methods, neural networks exhibit notable robustness since their functionality is not affected by parameter variations over a wide range. NN for linear programming can speed convergence greatly because the learning process can be carried out parallelly. In this paper we propose an energy function to be minimized by NN, get the learning algorithm, and design a new architecture for NN. An example of the use of NN in three-dimensional stereotactic radiotherapy treatment planning is described in this paper.

Key Words: Neural network, optimization, radiotherapy treatment planning