

AbstractID: 1803 Title: On the use of curvature information in IMRT optimization

A standard way of solving IMRT optimization problems is to use gradient based methods. The quality of the search direction obtained in each iteration is of vital importance to the optimization performance. The curvature information, included in the Hessian of the objective function, is often omitted when initializing gradient based solvers. In this study, we investigate the effect of curvature information on the optimization performance. We propose to initialize a quasi-Newton sequential quadratic programming solver with a more accurate approximation of the Hessian than what is commonly used. By adding curvature information, the search directions should be improved with the consequence that an adequate dose distribution can be achieved in less iterations. This has been investigated for an IMRT problem with physical objective functions. By comparing the optimization progress with and without curvature information, it can be concluded that the search directions are substantially improved with the proposed approach. It was found that although the time needed to calculate the improved directions was increased, the overall convergence was asymptotically faster. Research performed at RaySearch Laboratories.