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Abstract

Multicriteria optimization problems occur in many real life applications, for example in cancer radiotherapy treatment and in particular in intensity modulated radiation therapy (IMRT). In this work we focus on optimization problems with multiple objectives that are ranked according to their importance. We solve these problems numerically by combining lexicographic optimization with our recently proposed level set scheme, which yields a sequence of auxiliary convex feasibility problems; solved here via projection methods. The projection enables us to combine the newly introduced superiorization methodology with multicriteria optimization methods to speed up computation while guaranteeing convergence of the optimization. We demonstrate our scheme with a simple 2D academic example (used in the literature) and also present results from calculations on four real head neck cases in IMRT (Radiation Oncology of the Ludwig-Maximilians University, Munich, Germany) for two different choices of superiorization parameter sets suited to yield fast convergence for each case individually or robust behavior for all four cases.