alpha BB Method for Multiobjective and Set Optimization

A well-known deterministic method in smooth scalar-valued global optimization is the alpha Branch and Bound (alpha BB) method which uses convex underestimators of the objective function and a partition of the search domain. We shortly recall this method and then use the technique of convex underestimators for deriving a method to solve also multiobjective optimization problems globally. Thereby, a first step, which is already known in the literature, is to use the ideal point of the underestimated multiobjective problem for pruning. We improve this discarding test by using ideas from outer approximation techniques from convex multiobjective optimization combined with the concept of local upper bounds.

We apply these techniques also for computing a covering of the set of optimal solutions of a robust multiobjective optimization problem. There, decision uncertainty is taken into account by considering to each variable all possible realizations and their objective function values. By choosing a robust approach this leads to a special set optimization problem. Hence, we use the above techniques from global multiobjective optimization for solving a special set optimization problem.