

EFFICIENT SOLUTION OF THE BI-OBJECTIVE NEWTON-TYPE SUBPROBLEM VIA A SCALAR DUAL FORMULATION

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We study the min–max quadratic subproblem that arises in the computation of Newton-type search directions for unconstrained multiobjective optimization. We derive an explicit dual formulation for this subproblem and show that, in the general case, it becomes a convex optimization problem over the simplex. In the bi-objective case, the dual problem simplifies further to the minimization of a scalar function on $[0, 1]$. Exploiting this special structure, we derive analytical properties of the dual function and propose a safeguarded Newton method for computing its minimizer. We prove global convergence of the method and show that, asymptotically, unit step sizes are accepted and the convergence is quadratic. We also discuss implementation issues and report numerical experiments illustrating the efficiency of the approach.