OPTIMAL ALGORITHMS FOR LARGE SCALE QUADRATIC PROGRAMMING PROBLEMS

Z. Dostál
VŠB-Technical University of Ostrava, 17. listopadu 15, CZ-70833 Ostrava 8, Czech Republic,
e-mail: zdenek.dostal@vsb.cz

Abstract

First we describe an active set based algorithm [1] for the solution of bound constrained quadratic programming problems. The working set based algorithm combines the the conjugate gradient method to explore the face of the feasible region defined by the current iterate with the reduced gradient projection with the fixed steplength. The precision of approximate solutions of the auxiliary unconstrained problems is controlled by the structure of violation of the Karush-Kuhn-Tucker conditions at the active constraints. The algorithm has R-linear rate of convergence in terms of the spectral condition number of the Hessian matrix and the finite termination property preserved even for the dual degenerate problems. The algorithm is then combined with a variant of the augmented Lagrangian type algorithm for strictly convex quadratic programming problems with equality constraints to obtain and algorithm for the solution of the bound and equality constrained problems. The update rule for the penalty parameter is introduced that is related to the increase of the augmented Lagrangian. A qualitatively new feature of the algorithm is a bound on the feasibility error that is independent of conditioning of the constraints and is valid even for dependent constraints and the quadratic functions with semidefinite Hessian. The algorithm turned out to be a key ingredient in the development of scalable algorithms for the solution of variational inequalities by FETI [3] and BETI [4] domain decomposition methods

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References

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