ON ATTRACTION OF NEWTON-TYPE ITERATES TO MULTIPLIERS VIOLATING SECOND-ORDER SUFFICIENCY CONDITIONS

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Abstract. Assuming that the primal part of the sequence generated by a Newton-type (e.g., SQP) method applied to an equality-constrained problem converges to a solution where the constraints are degenerate, we investigate whether the dual part of the sequence is attracted by those Lagrange multipliers which satisfy second-order sufficient condition (SOSC) for optimality, or by those multipliers which violate it. This question is relevant, for example, for applicability of some recently proposed approaches for handling degenerate constraints. In the case of degeneracy the multiplier set, if nonempty, is not a singleton. Typically, SOSC may hold with some multipliers but not with others. Methods for degenerate problems rely on the assumption that the dual part of the sequence approaches specifically those multipliers which satisfy SOSC. While convergence of the primal sequence (to a strict local minimizer satisfying SOSC with some associated multipliers) is natural, convergence of the dual sequence to "good" multipliers is by no means a given. Raising this question is the primary purpose of this paper. We show that for the class of damped Newton methods, convergence of the dual sequence to multipliers with needed properties is, in some sense, unlikely to occur. In particular, we demonstrate that the dual iterates are naturally attracted to certain special multipliers violating SOSC. We support our findings by some examples and numerical experiments on degenerate quadratically constrained quadratic programs. We also suggest a simple auxiliary procedure for computing multiplier estimates, which does not have the undesirable attraction property.

Note: This talk is based on a joint work with Alexey Izmailov.