The Moore-Penrose inverse and a dual method of quadratic optimization

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In the present paper we discuss the primal and the dual solution of a specific convex optimization problem, that is, the constrained minimization of a positive semidefinite quadratic form H, using the Moore Penrose inverse. The difference of a classical approach of convex optimization techiques is that we treat both (primal and dual) problems using only vectors $x \in \mathcal{N}(H)^{\perp}$. We present results about the solutions arising from the dual formulation of the problem. Moreover, we examine the primal and dual solutions with the use of the General Normal Equation in the case when the constraint equation is inconsistent.

References

[1] A. B. Israel, Generalized inverses and the Bott-Duffin network analysis, J. Math. Anal. Appl. **7** (1963), 428–435.

[2] A. Ben-Israel and T. N. E. Grenville, Generalized Inverses: Theory and Applications, Springer-Verlag, Berlin, 2002.

[3] S. Boyd and L. Vandenberghe, Convex Optimization, Cambridge University Press, New York, 2004.

[4] W. S. Dorn, Duality in quadratic programming, Quart. Appl. Math. **18**(2) (1960), 155–162.

[5] D. Drivaliaris, S. Karanasios and D. Pappas, Factorizations of EP operators, Linear Algebra Appl. **429** (2008), 1555–1567.

[6] C. W. Groetsch, Generalized Inverses of Linear Operators, Marcel Dekker Inc. New York, 1977.

[7] D. Luenberger, Optimization by Vector Space Methods, Wiley Publ. New York, 1969.

[8] D. Pappas, Restricted linear constrained minimization of quadratic functionals, Linear Multilinear Algebra, **61**(10) (2013), 1394–1407.

[9] P. Stanimirovic, D. Pappas and S. Miljkovic, Minimization of quadratic forms using the Drazin-inverse solution, Linear Multilinear Algebra, **62**(2) (2014), 252–266.