The simplification of Spectral Projected Gradient method for solving quadratic programs

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The numerical solution of many engineering problems leads to the problem of minimizing a strictly convex quadratic function subject to a given set of inequality constraints. The applications that will benefit from the developement of optimal algorithms for solving such an optimization problem are, for instance, the linear elasticity contact problems or the simulation of granular dynamics.
Birgin, Martínez, and Raydan [1] developed for solving such problems a new projected gradient descent method based on the combination of projected Barzilai-Borwein method [2] with additional Grippo-Lampariello-Lucidi line-search technique [3] to enforce the convergence using generalized Armijo condition. This Spectral Projected Gradient method (SPG) is sucessfully used by many authors for solving more general optimization problems than quadratic programs; however, authors in original paper demonstrates the efficiency solving box-constrained quadratic programming problems.
In our contribution, we examine the behaviour of SPG for solving optimization problems with strictly convex quadratic cost function. Using our observations, we are able to suggest a simple way how to simplify the whole algorithm. The original SPG performs several function value evaluations whereas our modification contains only one multiplication by Hessian matrix per iteration.
The performance of the algorithm is demonstrated and compared with original SPG on the solution of practical benchmark.

References

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