Single-Projection Procedure for Infinite Dimensional Convex Optimization Problems

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In this work, we consider a class of convex optimization problems in a real Hilbert space that can be solved by performing a single projection, i.e., by projecting an infeasible point onto the feasible set. Our results improve those established for the linear programming setting in Nurminski (2015) by considering problems that: (1) may have multiple solutions, (2) do not satisfy strict complementary conditions, and (3) possess non-linear convex constraints. As a by-product of our analysis, we provide a quantitative estimate on the required distance between the infeasible point and the feasible set in order for its projection to be a solution of the problem. Our analysis relies on a "sharpness" property of the constraint set; a new property we introduce here.