PROX-QP: Yet another Quadratic Programming Solver for Robotics and beyond

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Abstract: Quadratic programming (QP) has become a core modelling component in the modern engineering toolkit. Yet, modern numerical solvers have not reached the level of efficiency and reliability required in practical applications where speed, robustness, and accuracy are all necessary. In this presentation, we introduce first a few variations of the well-established Augmented Lagrangian method [1, 2, 3], specifically for solving QPs, which include heuristics for improving practical numerical performances. Those variants are embedded within an open-source software which includes an efficient C++ implementation, a modular API, as well as best-performing heuristics for our test-bed. Relying on this framework, we present then a benchmark studying the practical performances of modern optimization solvers [4, 5, 6, 7] for convex QPs on generic and complex problems of the literature [4, 8], as well as on common robotic scenarios. This benchmark notably highlights that this approach outperforms modern solvers in terms of efficiency, accuracy and robustness for small to medium-sized problems, while remaining competitive for higher dimensions.

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