

# Preconditioning in Fast Dual Gradient Methods

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- [CDC paper](#)
- [Implemented in QPgen](#)

First order optimization methods often perform poorly on ill-conditioned optimization problems. However, by preconditioning the problem data and solving the preconditioned problem, the performance of the first order method can be significantly improved. In this paper, we show how to compute such preconditioners when solving the dual of strongly convex optimization problems using fast dual proximal gradient methods. The proposed preconditioning is evaluated by solving ill-conditioned optimization problems that arise from controlling the pitch angle in an aircraft using model predictive control. The numerical example shows improvements of two to three orders of magnitude in the fast dual proximal gradient method compared to when no preconditioning is used.