

Control Applications of Nonlinear Convex Programming

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Since 1984 there has been a concentrated effort to develop efficient interior-point methods for linear programming (LP). In the last few years researchers have begun to appreciate a very important property of these interior-point methods (beyond their efficiency for LP): they extend gracefully to nonlinear convex optimization problems. New interior-point algorithms for problem classes such as semidefinite programming (SDP) or second-order cone programming (SOCP) are now approaching the extreme efficiency of modern linear programming codes. In this paper we discuss three examples of areas of control where our ability to efficiently solve nonlinear convex optimization problems opens up new applications. In the first example we show how SOCP can be used to solve robust open-loop optimal control problems. In the second example, we show how SOCP can be used to simultaneously design the set-point and feedback gains for a controller, and compare this method with the more standard approach. Our final application concerns analysis and synthesis via linear matrix inequalities and SDP.

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