Mathematics > Optimization and Control

Controller Synthesis for Robust Invariance of Polynomial Dynamical Systems using Linear Programming

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In this paper, we consider a control synthesis problem for a class of polynomial dynamical systems subject to bounded disturbances and with input constraints. More precisely, we aim at synthesizing at the same time a controller and an invariant set for the controlled system under all admissible disturbances. We propose a computational method to solve this problem. Given a candidate polyhedral invariant, we show that controller synthesis can be formulated as an optimization problem involving polynomial cost functions over bounded polytopes for which effective linear programming relaxations can be obtained. Then, we propose an iterative approach to compute the controller and the polyhedral invariant at once. Each iteration of the approach mainly consists in solving two linear programs (one for the controller and one for the invariant) and is thus computationally tractable. Finally, we show with several examples the usefulness of our method in applications.

Subjects: **Optimization and Control (math.OC)**; Systems and Control (cs.SY)

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