On feedback target control for uncertain discrete-time systems through polyhedral techniques

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Introduction

Problems of feedback target control for linear and bilinear dynamical discrete-time systems under uncertainties and state constraints are considered. There are known approaches to solving problems of this kind, including ones for differential systems, based on construction of solvability tubes (Krasovskii's bridges). Since practical construction of such tubes may be cumbersome, different numerical methods were devised. Among them constructive computation schemes for linear systems based on the ellipsoidal techniques were proposed (see, for example, [1,2]) and then expanded to the polyhedral techniques [3,4]. Such methods are ideologically close to interval analysis. Their main advantage is that they allow to find solutions by rather simple means.

Main results

Here we continue the development of methods of control synthesis for discrete-time systems using polyhedral (parallelotope-valued) solvability tubes. The paper deals with two types of problems, where the

controls appear either additively or in the system matrix (i.e., in the coefficients of the system). Both problems are considered for systems with parallelotope-bounded additive uncertainty and with interval uncertainties in the coefficients. Moreover the systems are considered under constraints on the state, where the state constraints are described in terms of zones (i.e., intersections of strips). The techniques for calculation of the polyhedral solvability tubes by the recurrent relations are presented. Control strategies, which can be constructed on the base of the mentioned polyhedral tubes, are proposed. In contrast to [3,4], these control strategies can be calculated by explicit formulas. Results of computer simulations are presented.

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