Goh, K.-C.; **Safonov, M. G.**; **Ly, J. H.**
Robust synthesis via bilinear matrix inequalities. (English) Zbl 0861.93015
Int. J. Robust Nonlinear Control 6, No. 9-10, 1079-1095 (1996).

The main contributions of the paper can be summarized as follows: (1) The μ/K_m-synthesis problem for mixed parametric and linear time-invariant uncertainty is proved to be reducible to a bilinear matrix inequality (BMI) problem. The BMI formulation is achieved by the use of generalized Popov multipliers, the linearization of the state space matrices of the closed loop plant with respect to the controller state space matrices, and the generalized positive real lemma. Expressing the non-convex μ/K_m-synthesis problem in the BMI framework allows the application of finite-dimensional joint local and global optimization methods over multiplier and controller parameters, and improves standard results (The D, $G-K$-iteration and $M-K$-iteration approaches for μ/K_m-synthesis). The simple bilinear structure of the BMI allows also the adaptation of a variety of linear matrix inequality based techniques for efficient local and global optimization in a wide variety of other controller synthesis problems.

(2) The paper investigates a fundamental underlying paradigm for robust control synthesis, viz. the topological separation, that explains why the BMI problem inevitably holds such a central place in the robust control synthesis theory.

(3) Finally, for the sake of completeness, the paper includes a full exposition of the so-called "positivity" approach to μ/K_m-synthesis.

Reviewer: S.Curteanu (Iaşi)

MSC:

93B50 Synthesis problems
93B35 Sensitivity (robustness)
15A39 Linear inequalities of matrices

Keywords:

positivity approach; μ/K_m-synthesis; bilinear matrix inequality; Popov multipliers; positive real lemma; linear matrix inequality; optimization; robust control synthesis; topological separation

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