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Communications

Solution Bounds for Algebraic Equations in Control Theory

A book "Solution Bounds for Algebraic Equations in Control Theory" by Svetoslav Savov, has been recently published by "Prof. Marin Drinov" Academic Publishing House (ISBN 978-954-322-750-1). The research work is supported by FP7 Grant AComIn No 316087, funded by the European Commission for Capacity Programmes in 2012-2016.

The book is intended for a wide circle of readers, including engineers, applied mathematicians, graduate students, etc., seeking a comprehensive view of the main results on the estimation of solutions of four algebraic equations, namely, the continuous-time and the discrete-time Lyapunov and Riccati equations.

The book is organized as follows. A detailed summary of the proposed various solution bounds for the considered algebraic equations since 1970-ies, is presented in Chapter I. Different approaches are discussed in order to demonstrate the efficiency and the shortcomings of a particular method.

As a consequence of this analysis and motivated by the conservatism in solution estimation, the author suggests a new approach to extend the sets of coefficient matrices, for which various bounds are valid under less restrictive conditions. The main contributions can be briefly formulated as follows.

1. It has been proved that extensions can be achieved by taking into account the singular value decomposition of the coefficient matrix for both continuous-time (Chapter 2) and discrete-time (Chapter 3) equations.

2. Much attention is paid to the improvement of the solution bounds. It is shown how the available bounds can be used to derive new tighter estimates.

The bounds proposed in the book are illustrated by eleven numerical examples, including four real data cases in Chapter 4. The results are analyzed with respect to the tightness and validity measured by several error indicators.

The book provides quick and easy references for the solution of different engineering and mathematical problems. Since both the mathematical development and the applications are considered, it can be useful for solving problems and for research purposes as well.

Ivan Popchev