

Differential Linear Matrix Inequalities

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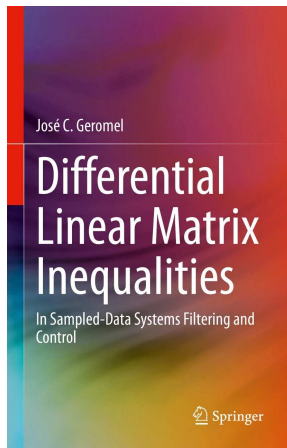
Campinas - Brazil
March 2025

Short biography

Professor José C. Geromel received the B.Sc. and M.Sc. degrees in Electrical Engineering from University of Campinas - UNICAMP, Brazil, in 1975 and 1976, respectively, and the Docteur d'État degree from LAAS / CNRS, Toulouse, France, in 1979. He was awarded in 1994 and 2014 the Zeferino Vaz Award by UNICAMP and, in 2007, the Scopus Award jointly awarded by Elsevier and CAPES / Brazil. Since 1991 he has been a Fellow 1-A of the Brazilian National Council for Scientific and Technological Development - CNPq. Since 1998 he has been a member of the Brazilian Academy of Science. In 1999, he was named Chevalier dans l'Ordre des Palmes Académiques by the French Minister of National Education. In 2010, he received the Docteur Honoris Causa degree from University Paul Sabatier, Toulouse, France. He was named in 2011 Distinguished Lecturer by the IEEE Control Systems Society. In 2018, he was promoted to Grã-Cruz of the Brazilian Order of Scientific Merit. He received the Bottura & Castrucci Lecture Prize, awarded by the Brazilian Society of Automatics - SBA, in 2024.

Bibliography

- ▶ New book published by Springer in 2023



New book

- ▶ Contents
 - ▶ **Chapter 1:** Preliminaries
 - ▶ **Chapter 2:** Differential Linear Matrix Inequalities
 - ▶ **Chapter 3:** Sampled-Data Control Systems
 - ▶ **Chapter 4:** \mathcal{H}_2 Filtering and Control
 - ▶ **Chapter 5:** \mathcal{H}_∞ Filtering and Control
 - ▶ **Chapter 6:** Markov Jump Linear Systems
 - ▶ **Chapter 7:** Nonlinear Systems Control
 - ▶ **Chapter 8:** Model Predictive Control
 - ▶ **Chapter 9:** Numerical Experiments
- ▶ Open Problems

Main goal

This course aims to present the book

- ▶ J. C. Geromel, [Differential Linear Matrix Inequalities - in Sampled-Data Systems Filtering and Control](#), Springer, 2023.

After a brief recall of Linear Matrix Inequalities (LMIs), the motivation of studying the main subject of the book is tackled. It is shown that robust control of sampled-data systems can be treated by DLMI's keeping convex the optimal design problems to be handled. Different aspects of sampled-data control and filtering are covered, including Markov Jump Linear Systems, Nonlinear Systems of the class Lur'e and Model Predictive Control. The theoretical results are illustrated through examples solved and simulated with Matlab routines

Basic rules

- ▶ Duration of at most 16 class hours
- ▶ Flexibility on duration and contents depending on the audience's interest and needs
- ▶ Self-contained material including notions of LMIs
- ▶ Analysis and design using Matlab routines
- ▶ Time simulations using Matlab facilities

To be decided before the beginning of the course!

Main notation

- ▶ \mathbb{R} and \mathbb{N} - the sets of real and natural numbers
- ▶ \mathbb{S} - the set of symmetric matrices
- ▶ $X > 0$ indicates that X is symmetric and positive definite
- ▶ $\mathbb{K} = \{1, 2, \dots, N\}$
- ▶ Λ - the unit simplex in \mathbb{R}^N
- ▶ $\text{co}\{\cdot\}$ - the convex hull of $\{\cdot\}$
- ▶ $f[k] = f(t_k)$ for $k \in \mathbb{N}$