

Preface

This book provides a systematic study of control and filtering techniques for multidimensional systems. It is aimed at newcomers to multidimensional systems, especially researchers who want to develop novel results in this exciting subject. The presentation emphasizes practical methods, presenting numerous solved examples, and providing ideas for future research. Special emphasis is given to the effect of uncertainty and bounded signals on the stability and performance of these systems, with most of the results are provided in terms of linear matrix inequalities (LMIs). The text is accessible to researchers with basic knowledge in systems theory.

Each subsequent chapter is devoted to a particular problem, as follows:

- Stabilization of 2-D saturated systems.
- Stabilization of 2-D delayed systems.
- Stabilization of 2-D delayed systems with saturating control.
- Robust stabilization of 2-D uncertain systems.
- Positive stabilization of 2-D systems.
- Stabilization of 2-D Takagi–Sugeno systems, with attenuation of stochastic perturbations.
- Robust 2-D H_∞ filtering.
- Robust H_∞ filtering for 2-D delayed systems.
- Robust H_∞ filtering of 2-D Takagi–Sugeno systems.

These problems have been solved by the authors and their teams during the past decade. It is pointed out that all the developed results are presented with their proofs, the references where they appeared for the first time, and reproducible use of off-the-shelf software tools: They are illustrated using examples, showing how the proposed methodology can be applied to different problems. Whenever possible, the results have been compared with previous results in the literature, showing that the provided approaches give less conservative results. The book contains around 80 figures and 250 compiled references.

This book will open up several interesting research lines, as the results provided can be extended to other problems such as:

- Stabilization and robust filtering of repetitive systems.
- Output-feedback stabilization.
- H_∞ Control for uncertain 2-D singular systems.
- Robust H_∞ filtering of 2-D singular systems.
- Delay-dependent stabilization and filtering.

Thus, many open problems have been left for the reader, as ideas for classroom exercises, papers, or dissertations.

Abdellah Benzaouia
Abdelaziz Hmamed
Fernando Tadeo

Two-Dimensional Systems

From Introduction to State of the Art

Benzaouia, A.; Hmamed, A.; Tadeo, F.

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