Preface

The Challenge of Constraints

Willst du ins Unendliche schreiten,
Geh nur im Endlichen nach allen seiten.
If to the Infinite you want to stride,
Just walk in the Finite to every side.
Gott, Gemüt und Welt
Johann Wolfgang von Goethe

Constraints are common and are everywhere. Hard time-domain constraints on actuators, sensors, and state variables of dynamic systems are the most ubiquitous nonlinearities in practical control systems. Their impacts on stability, control performance, and safety have been well recognized by both control engineers and control theorists for many decades. The challenge of such constraints in analysis as well as in design of control systems is intense and dauntingly formidable and familiar; it needs no elaboration and explanation.

The primary focus of this book is on the problem of achieving simultaneous internal and external stabilization of linear systems subject to constraints in both semi-global and global framework. Our intended audience includes practicing engineers, graduate students, and researchers in the field of systems and control. A vast majority of the contents of this book are drawn from the research of the authors, their coworkers, and students. Thus, it bears the signature of the authors and has a recognizable identity and a coherence of point of view which can be characterized as a structural view in both the analysis and design of dynamic systems.

No work of this magnitude and nature can be undertaken without many sacrifices. The deeds of this book absorbed our time infinitely more than the deeds of our households. We thank our families for their tolerance and understanding. Naturally, the debt of gratitude to our families is paid in some way by dedicating this book to them. The PhD thesis work of Mr. Xu Wang reflects in many places, needless to say that we are indebted to him enormously. Also, we are certainly indebted to our editor, Dr. Tamer Başar, and the editorial staff at Birkhäuser. Our special thanks go to the copy editor for a meticulous editing that improved the text. Ali spent countless number of hours brooding over the manuscript of this book at Bucer's; the great coffee house of Moscow, Idaho. Ali acknowledges the contribution of all the good people of Bucer's, special thanks go to Ms. Pat Greenfield.

Finally, we trust and hope that a proper study of this book leads to a bounty of applications of what we strived to develop here. We await to realize that this is no idle dream.

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