

Preface

In the last fifteen years a great effort has been spent by control researchers to investigate the finite-time control problem for dynamical systems. The main objective of this book is that of presenting, in a unified framework, the main results appeared in the literature on this topic, with particular reference to the finite-time stability problems involving linear time-varying systems and hybrid systems whose continuous-time dynamics are linear time-varying.

We essentially consider three main topics: finite-time stability analysis and design for linear time-varying systems (both continuous-time and discrete-time) with ellipsoidal initial and trajectory sets; finite-time stability analysis for linear time-varying systems when the initial and trajectory sets are assumed to be piecewise quadratic; finite-time stability analysis and control for hybrid systems whose continuous-time dynamics are described by a linear time-varying system. For each main problem, except for the case where piecewise quadratic sets are considered, the results are given in the form of necessary and sufficient conditions involving the feasibility of differential linear matrix inequalities and problems based on differential Lyapunov equations.

For self-containedness purposes, most of the results provided in the book are proven. We have tried to maintain the development of the proofs as simple as possible, without sacrificing the mathematical rigor.

The work is essentially devoted to both researchers in the field of systems and control theory and engineers working in industries who want to apply the methodologies presented in the book to practical control problems. To this regard, as the various results are derived, they are immediately reinforced with real-world examples.

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