Nonlinear H2/H∞ Constrained Feedback Control [A Practical Design Approach Using Neural Networks /

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Monografía

Modern aerospace, automotive, nautical, industrial, microsystem-assembly and robotic systems are becoming more and more complex. High-performance vehicles no longer have built-in error safety margins, but are inherently unstable by design to allow for more flexible maneuvering options. With the push towards better performance in terms of greater accuracy and faster speed of response, control demands are increasing. The combination of highly nonlinear dynamics, relaxed static stability, and tight performance specifications places increasing demands on the design of feedback systems for control. Current control system design techniques have difficulty in meeting these demands. In this book the authors present algorithms for H2 and H-infinity design for nonlinear systems which, unlike earlier theories, provide solution techniques for the core Hamilton–Jacobi equations that yield control systems which can be implemented in real systems; neural networks are used to solve the nonlinear control design equations. Industrial and aerospace systems usually have constraints on the amplitudes of the control actuator inputs so techniques are set out for dealing with these. All results are proven mathematically to give confidence and performance guarantees and the design algorithms can be used to obtain practically useful controllers. Nearly optimal applications to constrained-state and minimum-time problems are also discussed and since control systems are usually implemented using computer microprocessors, a chapter is devoted to discrete-time design to yield digital controllers. Nonlinear H2 /H-infinity Constrained Feedback Control will be of major importance to control systems designers working in industrial, automotive, robotic, military and chemical process systems. Design and simulation case studies are given and the design of nonlinear control systems of the same caliber as those obtained in recent years using linear optimal and bounded-norm designs based on the Riccati equation is explained together with feedback control systems of guaranteed high performance that can be implemented directly as a nonlinear network structure. With its opening chapter introducing such necessary control system foundations as Lyapunov theory, passivity and game theory, the book will also be of great interest to academics and their graduate students in control systems as a complete foundation for H2 and H-infinity design. Advances in Industrial Control aims to report and encourage the transfer of technology in control engineering. The rapid development of control technology has an impact on all areas of the control discipline. The series offers an opportunity for researchers to present an extended exposition of new work in all aspects of industrial control

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