



# **Control of Nonlinear Differential Algebraic Equation Systems with Applications to Chemical Processes (Chapman & Hall/CRC Research Notes in Mathematics Series)**

*Aditya Kumar, Prodromos Daoutidis*

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The feedback control of nonlinear differential and algebraic equation systems (DAEs) is a relatively new subject. Developing steadily over the last few years, it has generated growing interest inspired by its engineering applications and by advances in the feedback control of nonlinear ordinary differential equations (ODEs). This book-the first of its kind-introduces the reader to the inherent characteristics of nonlinear DAE systems and the methods used to address their control, then discusses the significance of DAE systems to the modeling and control of chemical processes. Within a unified framework, Control of Nonlinear Differential Algebraic Equation Systems presents recent results on the stabilization, output tracking, and disturbance elimination for a large class of nonlinear DAE systems.

Written at a basic mathematical level-assuming some familiarity with analysis and control of nonlinear ODEs-the authors focus on continuous-time systems of differential and algebraic equations in semi-explicit form. Beginning with background material about DAE systems and their differences from ODE systems, the book discusses generic classes of chemical processes, feedback control of regular and non-regular DAE systems, control of systems with disturbance inputs, the connection of the DAE systems considered with singularly perturbed systems, and finally offers examples that illustrate the application of control methods and the advantages of using high-index DAE models as the basis for controller design. Mathematicians and engineers will find that this book provides unique, timely results that also clearly documents the relevance of DAE systems to chemical processes.

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