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Sinopsis

Differential equations with delay naturally arise in various applications, such as control systems, viscoelasticity, mechanics, nuclear reactors, distributed networks, heat flows, neural networks, combustion, interaction of species, microbiology, learning models, epidemiology, physiology, and many others. This book systematically investigates the stability of linear as well as nonlinear vector differential equations with delay and equations with causal mappings. It presents explicit conditions for exponential, absolute and input-to-state stabilities. These stability conditions are mainly formulated in terms of the determinants and eigenvalues of auxiliary matrices dependent on a parameter; the suggested approach allows us to apply the well-known results of the theory of matrices. In addition, solution estimates for the considered equations are established which provide the bounds for regions of attraction of steady states. The main methodology presented in the book is based on a combined usage of the recent norm estimates for matrix-valued functions and the following methods and results: the generalized Bohl-Perron principle and the integral version of the generalized Bohl-Perron principle; the freezing method; the positivity of fundamental solutions. A significant part of the book is devoted to the Aizerman-Myshkis problem and generalized Hill theory of periodic systems. The book is intended not only for specialists in the theory of functional differential equations and control theory, but also for anyone with a sound mathematical background interested in their various applications.

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