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                      designs / / Thomas Meurer

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   Collana   Communications and control engineering

   Disciplina   500

   Soggetti   Distributed parameter systems
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                      Differential equations, Partial

   Lingua di pubblicazione   Inglese

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   Livello bibliografico   Monografia

   Note generali   Description based upon print version of record.

   Nota di bibliografia   Includes bibliographical references and index.

   Nota di contenuto Model equations for multi–agent networks -- Model equations for
                      flexible structures with piezoelectric actuation -- Mathematical
                      problem formulation -- Spectral approach for time–invariant systems
                      with general spatial domain -- Formal integration approach for time
                      varying systems -- Backstepping for linear diffusion–convection–
                      reaction systems with varying parameters on 1–dimensional domains
                      -- Backstepping for linear diffusion–convection–reaction systems with
                      varying parameters on parallelepiped domains.

   Sommario/riassunto This monograph presents new model-based design methods for
                      trajectory planning, feedback stabilization, state estimation, and
                      tracking control of distributed-parameter systems governed by partial
                      differential equations (PDEs). Flatness and backstepping techniques and
                      their generalization to PDEs with higher-dimensional spatial domain lie
                      at the core of this treatise. This includes the development of systematic
                      late lumping design procedures and the deduction of semi-numerical
                      approaches using suitable approximation methods. Theoretical
                      developments are combined with both simulation examples and

experimental results to bridge the gap between mathematical theory and control engineering practice in the rapidly evolving PDE control area. The text is divided into five parts featuring: - a literature survey of paradigms and control design methods for PDE systems - the first principle mathematical modeling of applications arising in heat and mass transfer, interconnected multi-agent systems, and piezo-actuated smart elastic structures - the generalization of flatness-based trajectory planning and feedforward control to parabolic and biharmonic PDE systems defined on general higher-dimensional domains - an extension of the backstepping approach to the feedback control and observer design for parabolic PDEs with parallelepiped domain and spatially and time varying parameters - the development of design techniques to realize exponentially stabilizing tracking control - the evaluation in simulations and experiments Control of Higher-Dimensional PDEs — Flatness and Backstepping Designs is an advanced research monograph for graduate students in applied mathematics, control theory, and related fields. The book may serve as a reference to recent developments for researchers and control engineers interested in the analysis and control of systems governed by PDEs.