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4.2 Description of a Piezoelectric Smart System
4.2.1 Typical Structure of a Piezoelectric Smart System; 4.2.2 Working Principle of a Capacitive Displacement Sensor; 4.3 Multifield Modeling of the Hysteretic Dynamics; 4.3.1 Multifield Modeling of the Hysteretic Dynamics; 4.4 Identification Strategy Design; 4.4.1 Pre-execution of the Creep, Electrical, and Vibration Dynamics; 4.4.2 Identification of the Creep, Electrical, and Vibration Dynamics; 4.4.3 Identification of the Preisach Hysteresis; 4.5 Experimental Studies of the Proposed Modeling and Identification; 4.5.1 Experimental Setup
4.5.2 Identification Result for the Creep, Electrical, and Vibration Dynamics
4.5.3 Identification Result for the Preisach Hysteresis; 4.5.4 Discussion; 4.6 Complete Modeling of Hysteretic Dynamics in Piezoelectric Smart Systems with High Stiffness; 4.7 Conclusion; References; Chapter 5: Control Approaches for Systems with Hysteresis; 5.1 Introduction; 5.2 PID Control Tuning; 5.2.1 Ziegler-Nichols Tuning Control; 5.2.2 Ziegler-Nichols Tuning of Systems with Hysteresis; 5.2.3 Integral Control; 5.3 Inversion-Based Feedforward Control; 5.3.1 Preisach Hysteresis-Based Feedforward Control
5.3.2 Composite Hysteresis-Based Feedforward Control

Sommario/riassunto

Modelling and Precision Control of Systems with Hysteresis covers the piezoelectric and other smart materials that are increasingly employed as actuators in precision engineering, from scanning probe microscopes (SPMs) in life science and nano-manufacturing, to precision active optics in astronomy, including space laser communication, space imaging cameras, and the micro-electro-mechanical systems (MEMS). As smart materials are known for having hysteretic dynamics, it is necessary to overcome issues with a broadband range of frequencies. This book offers both the mathematical tools for modeling the systems and applications, including complete case studies and source code for the experiments to help both academics and researchers in the industry to achieve precision in the control of Smart Actuator systems.
