



Modeling and Control of Precision Actuators

Tan Kok Kiong, Huang Sunan

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Modeling and Control of Precision Actuators explores new technologies that can ultimately be applied in a myriad of industries. It covers dynamical analysis of precise actuators and strategies of design for various control applications. The book addresses four main schemes: modeling and control of precise actuators; nonlinear control of precise actuators, including sliding mode control and neural network feedback control; fault detection and fault-tolerant control; and advanced air bearing control. It covers application issues in the modeling and control of precise actuators, providing several interesting case studies for more application-oriented readers.

- Introduces the driving forces behind precise actuators
- Describes nonlinear dynamics of precise actuators and their mathematical forms, including hysteresis, creep, friction, and force ripples
- Presents the control strategies for precise actuators based on Preisach model as well as creep dynamics
- Develops relay feedback techniques for identifying nonlinearities such as friction and force ripples
- Discusses a MPC approach based on piecewise affine models which emulate the frictional effects in the precise actuator
- Covers the concepts of air bearing stages with the corresponding control method
- Provides a set of schemes suitable for fault detection and accommodation control of mechanical systems

Emphasizing design theory and control strategies, the book includes simulation and practical examples for each chapter; covers precise actuators such as piezo motors, coil motors, air bearing motors, and linear motors; discusses integration among different technologies; and includes three case studies in real projects. The book concludes by linking design methods and their applications, emphasizing the key issues involved and how to implement the precision motion control tasks in a practical system. It provides a concise and comprehensive source of the state-of-the-art developments and results for modeling and control of precise actuators.

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