



# Piezoelectric Actuators: Control Applications of Smart Materials

By Seung-Bok Choi, Young-Min Han



**Piezoelectric Actuators: Control Applications of Smart Materials** By Seung-Bok Choi, Young-Min Han

Currently, many smart materials exhibit one or multifunctional capabilities that are being effectively exploited in various engineering applications, but these are only a hint of what is possible. Newer classes of smart materials are beginning to display the capacity for self-repair, self-diagnosis, self-multiplication, and self-degradation. Ultimately, what will make them practical and commercially viable are control devices that provide sufficient speed and sensitivity. While there are other candidates, piezoelectric actuators and sensors are proving to be the best choice.

**Piezoelectric Actuators: Control Applications of Smart Materials** details the authors' cutting-edge research and development in this burgeoning area. It presents their insights into optimal control strategies, reflecting their latest collection of refereed international papers written for a number of prestigious journals.

*Piezoelectric materials are incorporated in devices used to control vibration in flexible structures. Applications include beams, plates, and shells; sensors and actuators for cabin noise control; and position controllers for structural systems such as the flexible manipulator, engine mount, ski, snowboard, robot gripper, ultrasonic motors, and various type of sensors including accelerometer, strain gage, and sound pressure gages.*

The contents and design of this book make it useful as a professional reference for scientists and practical engineers who would like to create new machines or devices featuring smart material actuators and sensors integrated with piezoelectric materials. With that goal in mind, this book:

- Describes the piezoelectric effect from a microscopic point of view
- Addresses vibration control for flexible structures and other methods that use active mount
- Covers control of flexible robotic manipulators
- Discusses application to fine-motion and hydraulic control systems
- Explores piezoelectric shunt technology

This book is exceptionally valuable as a reference for professional engineers working at the forefront of numerous industries. With its balanced presentation of theory and application, it will also be of special interest to graduate students studying control methodology.

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### Editorial Review

#### About the Author

**Seung-Bok Choi** received his Ph.D. in mechanical engineering from Michigan State University, East Lansing, in 1990. Since 1991, he has been a professor at Inha University, Incheon, South Korea. His current research interests include the design and control of functional structures and systems utilizing smart materials such as electrorheological and magnetorheological fluids, piezoelectric materials, and shape memory alloys. He is the author of over 250 archival international journal and book contributions, and 170 international conference publications. He is currently serving as the associate editor of the Journal of Intelligent Material Systems and Structures and Smart Materials and Structures, and is a member of the editorial board of the International Journal of Vehicle Autonomous Systems and the International Journal of Intelligent Systems Technologies and Applications.

**Young-Min Han** received his Ph.D. in mechanical engineering from Inha University, Incheon, South Korea, in 2005. Since 2006, he has been a research professor at Inha University. His current research interest includes the design and control of functional mechanisms utilizing smart materials such as active mounts, dispensing systems, shock absorbers, robotic manipulators, and human-machine interfaces. Dr. Han is the author of over 30 international journal papers and 20 international conference proceedings.

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