

Fundamentals in Modeling and Control of Mobile Manipulators (Automation and Control Engineering)

By Zhijun Li, Shuzhi Sam Ge



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Mobile manipulators combine the advantages of mobile platforms and robotic arms, extending their operational range and functionality to large spaces and remote, demanding, and/or dangerous environments. They also bring complexity and difficulty in dynamic modeling and control system design. However, advances in nonlinear system analysis and control system design offer powerful tools and concepts for the control of mobile manipulator systems. **Fundamentals in Modeling and Control of Mobile Manipulators** presents a thorough theoretical treatment of several fundamental problems for mobile robotic manipulators.

The book integrates fresh concepts and state-of-the-art results to systematically examine kinematics and dynamics, motion generation, feedback control, coordination, and cooperation. From this treatment, the authors form a basic theoretical framework for a mobile robotic manipulator that extends the theory of nonlinear control and applies to more realistic problems. Drawing on their research over the past ten years, the authors propose novel control theory concepts and techniques to tackle key problems.

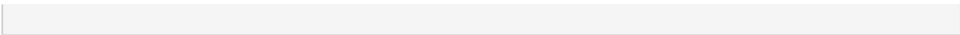
Topics covered include kinematic and dynamic modeling, control of nonholonomic systems, path planning that considers motion and manipulation, hybrid motion/force control and hybrid position/force control where the mobile manipulator is required to interact with environments, and coordination and cooperation strategies for multiple mobile manipulators. The book also includes practical examples of applications in engineering systems. This timely book investigates important scientific and engineering issues for researchers and engineers working with either single or multiple mobile manipulators for larger operational space, better cooperation, and improved productivity.



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Fundamentals in Modeling and Control of Mobile Manipulators (Automation and Control Engineering) By Zhijun Li, Shuzhi Sam Ge Bibliography

- Sales Rank: #5181807 in Books
- Published on: 2013-06-04
- Original language: English
- Number of items: 1
- Dimensions: 9.10" h x .90" w x 6.20" l, .0 pounds
- Binding: Hardcover
- 295 pages

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Editorial Review

About the Author

Zhijun Li is a professor in the College of Automation Science and Engineering at the South China University of Technology. Dr. Li is an IEEE Senior Member. He is an editor of the *Journal of Intelligent and Robotic Systems*. His current research interests include adaptive/robust control, mobile manipulators, and nonholonomic systems.

Shuzhi Sam Ge is a professor in the Department of Electrical and Computer Engineering and director of the Social Robotics Laboratory, Interactive Digital Media Institute, at the National University of Singapore, and director of the Robotics Institute at the University of Electronic Science and Technology of China in Chengdu. He has co-authored five books and published more than 300 international journal and conference papers. He has been an associate editor for *IEEE Transactions on Automatic Control*, *IEEE Transactions on Control Systems Technology*, *IEEE Transactions on Neural Networks*, and is currently an associate editor for *Automatica*, as well as an editor for *International Journal of Social Robotics*, *International Journal of Control, Automation & Systems*, and the Taylor & Francis *Automation and Control Engineering Series*. His current research interests include social robotics, adaptive control, hybrid systems, and intelligent systems.

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