

1. Record Nr.	UNINA9910659480603321
Autore	Huang Jian (Biologist)
Titolo	Robust and intelligent control of a typical underactuated robot : mobile wheeled inverted pendulum // Jian Huang, Mengshi Zhang, and Toshio Fukuda
Pubbl/distr/stampa	Singapore : , : Springer, , [2023] ©2023
ISBN	981-19-7157-9
Edizione	[1st ed. 2023.]
Descrizione fisica	1 online resource (123 pages)
Collana	Research on Intelligent Manufacturing, , 2523-3394
Disciplina	741.5
Soggetti	Intelligent control systems Robots - Control systems
Lingua di pubblicazione	Inglese
Formato	Materiale a stampa
Livello bibliografico	Monografia
Nota di contenuto	Chapter 1 Introduction -- Chapter 2 Modeling of Mobile Wheeled Inverted Pendulums -- Chapter 3 Disturbance-Observer-Based Sliding Mode Control for Mobile Wheeled Inverted Pendulum Systems -- Chapter 4 Sliding Mode Variable Structure Based Chattering Avoidance Control for Mobile Wheeled Inverted Pendulums -- Chapter 5 Interval Type-2 Fuzzy Logic Control of Mobile Wheeled Inverted Pendulums -- Chapter 6 Experiments of Controlling Real Mobile Wheeled Inverted Pendulums -- Chapter 7 Conclusion.
Sommario/riassunto	This book presents the achievements of the author's team in the research of a special underactuated system called mobile wheeled inverted pendulum (MWIP) developed over recent years. It focuses on a combination of theory and practice, and almost all algorithms are verified on the real MWIP system. Taking the dynamic modeling, control, and simulation as the mainline, this book first introduces the particularity, control challenges, and applications of the MWIP system. Then, Lagrange function is adopted to model the dynamics of two-dimensional and three-dimensional MWIP systems. Then, based on the special characteristics of the MWIP's dynamics, a new high-order disturbance observer is designed, and a control strategy is proposed by combining the high-order disturbance observer with a novel design of

sliding mode manifold. Furthermore, several methods to overcome the chattering problem of the traditional sliding mode control are presented in detail. Besides, some intelligent algorithms related to the interval type-2 fuzzy logic control are applied to the MWIP system. Finally, the future development of underactuated robot has been prospected. This book is intended for researchers and engineers in robotics and control. It can also be used as supplementary reading for nonlinear systems theory at the graduate level. The in-depth theory and detailed platform construction provide an excellent convenience for readers to build their platforms and learn the knowledge they need.

---