

1. Record Nr.	UNINA9910453143603321
Autore	Tzafestas S. G. <1939->
Titolo	Introduction to mobile robot control // Spyros G. Tzafestas
Pubbl/distr/stampa	Waltham, MA : , : Elsevier, , [2014] ©2014
ISBN	0-12-810050-8 0-12-417103-6
Edizione	[First edition.]
Descrizione fisica	1 online resource (718 p.)
Collana	Elsevier insights
Disciplina	718
Soggetti	Mobile robots Robots - Control systems Autonomous robots Electronic books.
Lingua di pubblicazione	Inglese
Formato	Materiale a stampa
Livello bibliografico	Monografia
Note generali	Description based upon print version of record.
Nota di bibliografia	Includes bibliographical references.
Nota di contenuto	Front Cover; Introduction to Mobile Robot Control; Copyright Page; Dedication; Contents; Preface; List of acknowledged authors and collaborators; Principal symbols and acronyms; Quotations about robotics; 1 Mobile Robots: General Concepts; 1.1 Introduction; 1.2 Definition and History of Robots; 1.2.1 What Is a Robot?; 1.2.2 Robot History; 1.2.2.1 Ancient and Preindustrial Period; 1.2.2.2 Industrial and Robosapien Period; 1.3 Ground Robot Locomotion; 1.3.1 Legged Locomotion; 1.3.2 Wheeled Locomotion; 1.3.2.1 Wheel Types; 1.3.2.2 Drive Types; 1.3.2.3 WMR Maneuverability; References 2 Mobile Robot Kinematics 2.1 Introduction; 2.2 Background Concepts; 2.2.1 Direct and Inverse Robot Kinematics; 2.2.2 Homogeneous Transformations; 2.2.3 Nonholonomic Constraints; 2.3 Nonholonomic Mobile Robots; 2.3.1 Unicycle; 2.3.2 Differential Drive WMR; 2.3.3 Tricycle; 2.3.4 Car-Like WMR; 2.3.5 Chain and Brockett-Integrator Models; 2.3.5.1 Unicycle WMR; 2.3.5.2 Rear-Wheel Driving Car; 2.3.6 Car-Pulling Trailer WMR; 2.4 Omnidirectional WMR Kinematic Modeling; 2.4.1 Universal Multiwheel Omnidirectional WMR; 2.4.2 Four-Wheel Omnidirectional WMR with Mecanum Wheels; References 3 Mobile Robot Dynamics 3.1 Introduction; 3.2 General Robot Dynamic

Modeling; 3.2.1 Newton-Euler Dynamic Model; 3.2.2 Lagrange Dynamic Model; 3.2.3 Lagrange Model of a Multilink Robot; 3.2.4 Dynamic Modeling of Nonholonomic Robots; 3.3 Differential-Drive WMR; 3.3.1 Newton-Euler Dynamic Model; 3.3.2 Lagrange Dynamic Model; 3.3.3 Dynamics of WMR with Slip; 3.4 Car-Like WMR Dynamic Model; 3.5 Three-Wheel Omnidirectional Mobile Robot; 3.6 Four Mecanum-Wheel Omnidirectional Robot; References; 4 Mobile Robot Sensors; 4.1 Introduction; 4.2 Sensor Classification and Characteristics 4.2.1 Sensor Classification 4.2.2 Sensor Characteristics; 4.3 Position and Velocity Sensors; 4.3.1 Position Sensors; 4.3.2 Velocity Sensors; 4.4 Distance Sensors; 4.4.1 Sonar Sensors; 4.4.2 Laser Sensors; 4.4.3 Infrared Sensors; 4.5 Robot Vision; 4.5.1 General Issues; 4.5.2 Sensing; 4.5.2.1 Camera Calibration; 4.5.2.2 Image Acquisition; 4.5.2.3 Illumination; 4.5.2.4 Imaging Geometry; 4.5.3 Preprocessing; 4.5.4 Image Segmentation; 4.5.5 Image Description; 4.5.6 Image Recognition; 4.5.7 Image Interpretation; 4.5.8 Omnidirectional Vision; 4.6 Some Other Robotic Sensors; 4.6.1 Gyroscope 4.6.2 Compass 4.6.3 Force and Tactile Sensors; 4.6.3.1 Force Sensors; 4.6.3.2 Tactile Sensors; 4.7 Global Positioning System; 4.8 Appendix: Lens and Camera Optics; References; 5 Mobile Robot Control I: The Lyapunov-Based Method; 5.1 Introduction; 5.2 Background Concepts; 5.2.1 State-Space Model; 5.2.2 Lyapunov Stability; 5.2.3 State Feedback Control; 5.2.4 Second-Order Systems; 5.3 General Robot Controllers; 5.3.1 Proportional Plus Derivative Position Control; 5.3.2 Lyapunov Stability-Based Control Design; 5.3.3 Computed Torque Control; 5.3.4 Robot Control in Cartesian Space 5.3.4.1 Resolved Motion Rate Control

Sommario/riassunto

Introduction to Mobile Robot Control provides a complete and concise study of modeling, control, and navigation methods for wheeled non-holonomic and omnidirectional mobile robots and manipulators. The book begins with a study of mobile robot drives and corresponding kinematic and dynamic models, and discusses the sensors used in mobile robotics. It then examines a variety of model-based, model-free, and vision-based controllers with unified proof of their stabilization and tracking performance, also addressing the problems of path, motion, and task planning, along with localization
