



Control of Single Wheel Robots (Springer Tracts in Advanced Robotics)

Yangsheng Xu, Yongsheng Ou

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This monograph presents a novel concept of a mobile robot, which is a single-wheel, gyroscopically stabilized robot. The robot is balanced by a spinning wheel attached through a two-link manipulator at the wheel bearing, and actuated by a drive motor. This configuration conveys significant advantages including insensitivity to attitude disturbances, high maneuverability, low rolling resistance, ability to recover from falls, and amphibious capability for potential applications on both land and water. This book focuses on the dynamics and control aspects, including modeling, model-based control, learning-based control, and shared control with human operators. This novel mobile robot concept opens up the science of dynamically stable systems with a single wheel configuration. The book also presents considerations in concept, design implementations, and kinematics modeling, as well as experimental results from various algorithms and cases. The system is a nonholonomic, underactuated, and highly nonlinear system, so this book is appropriate for scientists and engineers with interests in mobile robot, dynamics and control, as a research reference and postgraduate textbook.

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