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Nota di contenuto	Cover; Title Page; Copyright; Contents; About the Author; Preface; Chapter 1 Introduction; 1.1 Quantum States; 1.2 Quantum Systems Control Models; 1.2.1 Schrodinger Equation; 1.2.2 Liouville Equation; 1.2.3 Markovian Master Equations; 1.2.4 Non-Markovian Master Equations; 1.3 Structures of Quantum Control Systems; 1.4 Control Tasks and Objectives; 1.5 System Characteristics Analyses; 1.5.1 Controllability; 1.5.2 Reachability; 1.5.3 Observability; 1.5.4 Stability; 1.5.5 Convergence; 1.5.6 Robustness; 1.6 Performance of Control Systems; 1.6.1 Probability; 1.6.2 Fidelity; 1.6.3 Purity 1.7 Quantum Systems Control 1.7.1 Description of Control Problems; 1.7.2 Quantum Control Theory and Methods; 1.8 Overview of the Book; References; Chapter 2 State Transfer and Analysis of Quantum Systems on the Bloch Sphere; 2.1 Analysis of a Two-level Quantum System State; 2.1.1 Pure State Expression on the Bloch Sphere; 2.1.2 Mixed States in the Bloch Sphere; 2.1.3 Control Trajectory on the Bloch Sphere; 2.2 State Transfer of Quantum Systems on the Bloch Sphere; 2.2.1 Control of a Single Spin-1/2 Particle; 2.2.2 Situation with the Minimum t of Control Fields 2.2.3 Situation with a Fixed Time T2.2.4 Numerical Simulations and Results Analyses; References; Chapter 3 Control Methods of Closed

Quantum Systems; 3.1 Improved Optimal Control Strategies Applied in Quantum Systems; 3.1.1 Optimal Control of Quantum Systems; 3.1.2 Improved Quantum Optimal Control Method; 3.1.3 Krotov-Based Method of Optimal Control; 3.1.4 Numerical Simulation and Performance Analysis; 3.2 Control Design of High-Dimensional Spin-1/2 Quantum Systems; 3.2.1 Coherent Population Transfer Approaches 3.2.2 Relationships between the Hamiltonian of Spin-1/2 Quantum Systems under Control and the Sequence of Pulses 3.2.3 Design of the Control Sequence of Pulses; 3.2.4 Simulation Experiments of Population Transfer; 3.3 Comparison of Time Optimal Control for Two-Level Quantum Systems; 3.3.1 Description of System Model; 3.3.2 Geometric Control; 3.3.3 Bang-Bang Control; 3.3.4 Time Comparisons of Two Control Strategies; 3.3.5 Numerical Simulation Experiments and Results Analyses; References; Chapter 4 Manipulation of Eigenstates-Based on Lyapunov Method  
4.1 Principle of the Lyapunov Stability Theorem 4.2 Quantum Control Strategy Based on State Distance; 4.2.1 Selection of the Lyapunov Function; 4.2.2 Design of the Feedback Control Law; 4.2.3 Analysis and Proof of the Stability; 4.2.4 Application to a Spin-1/2 Particle System; 4.3 Optimal Quantum Control Based on the Lyapunov Stability Theorem; 4.3.1 Description of the System Model; 4.3.2 Optimal Control Law Design and Property Analysis; 4.3.3 Simulation Experiments and the Results Comparisons; 4.4 Realization of the Quantum Hadamard Gate Based on the Lyapunov Method; 4.4.1 Mathematical Model 4.4.2 Realization of the Quantum Hadamard Gate

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## Sommario/riassunto

"Control of Quantum Systems: Theory and Methods provides an insight into the modern approaches to control of quantum systems evolution, with a focus on both closed and open (dissipative) quantum systems. The topic is timely covering the newest research in the field, and presents and summarizes practical methods and addresses the more theoretical aspects of control, which are of high current interest, but which are not covered at this level in other text books. The quantum control theory and methods written in the book are the results of combination of macro-control theory and microscopic quantum system features. As the development of the nanotechnology progresses, the quantum control theory and methods proposed today are expected to be useful in real quantum systems within five years. The progress of the quantum control theory and methods will promote the progress and development of quantum information, quantum computing, and quantum communication"--

"Control of Quantum Systems: Theory and Methods provides an insight into the modern approaches to control of quantum systems evolution, with a focus on both closed and open (dissipative) quantum systems"--

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