



Numerical and Algebraic Studies for the Control of Quantum Systems

By Sander, Uwe

Condition: New. Publisher/Verlag: Südwestdeutscher Verlag für Hochschulschriften | Controllability and Optimal Control in Finite-Dimensional Quantum Systems | In this thesis, two aspects of control theory, namely controllability and optimal control, are applied to quantum systems. The presented results are based on group theoretical techniques and numerical studies. By Lie-algebraic analysis, the controllability properties of systems with an arbitrary topology are described and related to the symmetries existing in these systems. We find that symmetry precludes full controllability. Our work investigates well-known control systems and gives rules for the design of new systems. Furthermore, theoretical and numerical concepts are instrumental to studying quantum channels: Their capacities are optimised using gradient flows on the unitary group in order to find counterexamples to a long-established additivity conjecture. The last part of this thesis presents and benchmarks a modular optimal control algorithm known as GRAPE. Numerical tests show how the interplay of its modules can be optimised for higher performance, and how the algorithm performs in comparison to a Krotov-type optimal control algorithm. It is found that GRAPE performs particularly well when aiming for high qualities. | Format: Paperback | Language/Sprache: english | 213 gr | 220x150x8 mm | 148 pp.



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