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New Results for Quantum Control Problems

Towards a minimum L^2-norm exact-control of the Pauli equation

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Abstract: A computational framework for the exact-control of the magnetic state and the spin of an electron is presented. The evolution of this quantum system is governed by the Pauli equation, that is a system of Schrödinger equations coupled by the action of magnetic fields. The magnetic fields are used as controls in order to steer the quantum system from an initial state to a desired target state at a given final time.
This control framework is based on a minimum norm optimization formulation of exact-controllability quantum problems, that allows the application of efficient Krylov-Newton optimization techniques. Furthermore, in order to provide this framework with an adequate initialization, a continuation procedure is discussed. Results of numerical experiments demonstrate the effectiveness of the proposed framework.