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(G*) (POS-8) Quantum Control of Trapped Ions Using Krotov's Algorithm

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The optimization of quantum systems using Quantum Optimal Control Theory (QOCT) is very important in many fields such as quantum information, photocatalysis, and atomic and molecular physics. The goal of QOCT is to optimize an external field shape such that it drives a quantum system to a target state. When applied to the real world, QOCT can be used to develop quantum gates in quantum computing or to achieve a particular state in atomic and molecular physics. There are many numerical methods that exist in order to determine the optimal external field shape when controlling quantum systems, with one being Krotov's algorithm. Krotov's algorithm minimizes the optimization functional, which consists of the figure of merit and any constraints. In this research, I apply Krotov's algorithm to determine the optimal external field shape to achieve quantum control in a chain of trapped ions employing the Sørensen & Mølmer scheme. I numerically implement Krotov's algorithm and compare its performance to other methods.

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