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Quantum Control via Enhanced Shortcuts to Adiabaticity

Shortcuts to Adiabaticity (STA) are a collection of quantum control techniques that allow perfect state transfer for certain quantum systems. In this work we develop and apply a new analytic extension to existing Shortcuts to Adiabaticity (STA) techniques, termed enhanced Shortcuts to Adiabaticity (eSTA). This new method works for previously intractable Hamiltonians by creating an analytic correction to existing STA schemes. The correction can be easily calculated and the resulting protocol may even be outside the original class of STA schemes.

We demonstrate the effectiveness of eSTA by simulating several examples: population transfer in two-level systems beyond the rotating wave approximation, as well as one and two (interacting) ion transport in non-harmonic traps.

Ref.: C.Whitty, A. Kiely and A. Ruschhaupt, in preparation.

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