Variational Control for Shortcuts to Adiabaticity in Ultracold Atomic Systems

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Controlling cold atoms efficiently by using shortcuts to adiabaticity is particularly of interest in quantum information processing, quantum metrology, and quantum thermodynamics. In this talk, we shall present the variational approximation approach, originally proposed in nonlinear optics, from which the Ermakov-like equation is derived to capturing the dynamics in nonlinear and many-body systems. By choosing appropriate boundary conditions, inverse engineering can be further combined to design the shortcut protocols in nonlinear and many-body systems. Here, we shall discuss the applications of this new paradigm to atomic cooling, soliton compression, and quantum thermodynamics as well.

References

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