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Title: Error suppression in adiabatic quantum computing with qubit ensembles

Abstract: Incorporating quantum error-correction into AQC in an effective and realistic way is an important task due to the inevitable presence of decoherence present in present-day quantum devices. In this talk, I will explain an error-protected encoding of the AQC Hamiltonian, where qubit ensembles are used in place of qubits. Our Hamiltonian only involves total spin operators of the ensembles — such that individual qubit control is unnecessary — thereby offering a simpler route towards error-corrected quantum computing. We identify a critical ensemble size Nc where the nature of the first excited state becomes a single particle perturbation of the ground state and the gap energy is predictable by mean-field theory. For ensemble sizes larger than Nc, the ground state becomes protected and the AQC performance improves with N, as long as the decoherence rate is sufficiently low. Our Hamiltonian is potentially applicable to various physical implementations but is particularly promising for those involving large number of qubits such as neutral atomic ensembles.