# Scaling analysis and instantons for quantum spin tunneling and Quantum Monte Carlo simulations

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We develop an instantonic calculus for the thermally-assisted tunneling decay rate in a fully connected quantum spin model. We show that the tunneling decay problem can be mapped onto the Kramers escape problem of a classical random dynamical field. This dynamical field is simulated efficiently by Path Integral Quantum Monte Carlo (QMC). We show that the exponential scaling with the number of spins of the quantum tunneling rate and the escape rate of the QMC process are identical. We provide further examples where QMC has quadratic speed up in scaling over quantum tunneling.