Weak field control employing the stochastic surrogate Hamiltonian

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Simulation of many body quantum dynamics scales exponentially bad with the number of degrees of freedom. Many methods are devoted to obtain a restricted many body wavefunction which still are able to approximate the quantum dynamics. In the context of system bath dynamics the surrogate Hamiltonian method the dynamics is simplified by replacing the bath Hamiltonian by a simpler version which describes the bath faithfully up to a specified time. The computation task becomes even more formidable when the dynamics takes place at a finite temperature, then formally the wavefunction has to be replaced with a density operator. We present a stochastic methods which allows to describe finite temperature dynamics within a wavefunction description. The stochastic methods are applied for the initial thermal sampling. In addition the dynamical description of the bath is extended stochasticly to take care of dephasing and energy relaxation at long times. We use this method to simulate an outstanding problem in coherent control: can we obtain weak field control of a branching ratio? The model consists of a ground state and two excited state potentials. The target is to control the population in these states using phase modulation only.

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