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A geometrical approach to dynamical decoupling with smooth pulses JUNKAI ZENG, XIUHAO DENG, EDWIN BARNES, Department of Physics, Virginia Tech — In order to perform high-fidelity quantum information processing, reducing the effects of noise is an essential task. It is well known that a system can be decoupled from noise dynamically by using carefully designed pulse sequences based on delta-function or square waveforms such as spin echo or CPMG. However, such ideal pulses are often challenging to implement experimentally with high fidelity. We present an analytical approach that enables one to generate an unlimited number of smooth, experimentally feasible pulses that perform dynamical decoupling or dynamically corrected gates. Our method is based on a simple geometric picture that facilitates the identification of driving fields that cancel errors in the single-qubit evolution operator to second order or beyond. We demonstrate that this scheme can significantly enhance the fidelity of single-qubit gates in the case of noise with a 1/f power spectrum.

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