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Path integral approach to random motion with nonlinear friction
ADRIAN BAULE, E. G. D. COHEN COLLABORATION — Using a path integral approach, we derive an analytical solution of a nonlinear and singular Langevin equation, which has been introduced previously by P.-G. de Gennes as a simple phenomenological model for the *stick-slip* motion of a solid object on a vibrating horizontal surface. We show that the optimal (or most probable) paths of this model can be divided into two classes of paths, which correspond physically to a sliding or slip motion, where the object moves with a non-zero velocity over the underlying surface, and a stick-slip motion, where the object is stuck to the surface for a finite time. These two kinds of basic motions underlie the behavior of many more complicated systems with solid/solid friction and appear naturally in de Gennes' model in the path-integral framework.

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