Mathematics > Analysis of PDEs

Averaging approximation to singularly perturbed nonlinear stochastic wave equations

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An averaging method is applied to derive effective approximation to the following singularly perturbed nonlinear stochastic damped wave equation \nu u_{tt}+u_t=\D u+f(u)+\nu^\alpha\dot{W} on an open bounded domain $D\subset\R^n$\,, $1\leq n\leq 3$\,. Here $\nu>0$ is a small parameter characterising the singular perturbation, and ν^α\,, $0\leq \alpha\leq 1/2$\,, parametrises the strength of the noise. Some scaling transformations and the martingale representation theorem yield the following effective approximation for small ν, u_t=\D u+f(u)+\nu^\alpha\dot{W} to an error of $\ord{\nu^\alpha}$\,.

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