

# **Optimal design problems with random perturbations**

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A multiple state optimal design problem in the context of stationary diffusion with presence of uncertainty on the right-hand side is considered. A similar problem with one state equation has already been considered by Buttazzo and Maestre (2011). We shall address the question of relaxation by the homogenization method and necessary conditions of optimality. The case of discrete probability space leads to another multiple state problem (possibly with an infinite number of states), which could be treated numerically by classical methods for (deterministic) optimal design problems. The relaxation can be expressed in a simpler form for problems with spherical symmetry in the case of minimization (or maximization) of averaged energy, in which case even analytic solutions are obtainable.