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Numerical Solution of the Poisson Equation on Domains with a Thin Layer of Random Thickness

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SUMMARY

I will talk about the numerical solution of the Poisson equation on domains with a thin layer of different conductivity and of random thickness. By changing the boundary condition, the boundary value problem given on a random domain is transformed into a boundary value problem on a fixed domain. The randomness is then contained in the coefficients of the new boundary condition. This thin coating can be expressed by a random Robin boundary condition which yields a third order accurate solution in the scale parameter ϵ of the layers thickness. With the help of the KarhunenLoeve expansion, we transform this random boundary value problem into a deterministic parametric one with a possibly high-dimensional parameter y. Based on the decay of the random fluctuations of the layers thickness, we prove rates of decay of the derivatives of the random solution with respect to this parameter y which are robust in the scale parameter ϵ. Numerical results validate our theoretical findings.

Keywords: Poisson Equation, Numerical Solution

AMS Classification: -

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