# Bounds for the distribution of the maximum of Gaussian processes.

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In numerous statistical problems involving multidimensional random processes, the maximum plays potentially an important role. Our goal is to study its distribution in a one- or two-dimensional framework. The method consists in the generalization of the Rice method (introducing a time passage also considered by Rychlik [3]) to obtain a closed but implicit formula. As a consequence, we propose a numerical method to estimate the survival function of this maximum. The lower bound is given by single discretization and the upper bound is deduced from the implicit formula.

Numerical applications have been run under MATLAB since our procedure calls the routine "rind" from the version 2.0.5 of WAFO which computes Gaussian integrals. In dimension one, our approximations are compared with Rice upper bound and also with estimations given by the Rice series, proposed by Azaïs and Wschebor [2]. On the plane we make comparisons with equivalents proposed in the literature (see Adler [1]).

[1] Adler, *The geometry of random fields*, John Wiley & Sons Ltd., Chichester, 1981.

[2] Azaïs and Wschebor, The distribution of the maximum of a Gaussian process: Rice method revisited, *In and out of equilibrium (Mambucaba, 2000)* 321–348, 51, 2002.

[3] Rychlik, A note on Durbin formula for the first-passage density, *Stat. Prob. Lett. 5*, 425–428, 6, 1987.

[4] WAFO: Brodtkorb, Johannesson, Lindgren, Rychlik, Rydén and Sjö. www.maths.lth.se/matstat/wafo