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EXTREMA OF GAUSSIAN PROCESS BY SIMULATION

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Problems related to level-crossings by stochastic processes are introduced and a number of papers related to this field are reviewed. Some exact mathematical results which are either applicable in asymptotic cases or refer to particular processes are given. Various methods which so far have been suggested for simulating stochastic processes are introduced.

A simple practical procedure for approximating a stationary Gaussian process over a finite interval by a trigonometric polynomial with pre-determined error is described. The approximation is then used to calculate the distribution of the maximum, using an efficient way of calculating a multivariate probability distribution by means of a novel Monte Carlo method with a control variable which reduces the variance.

The probability distribution of the maximum of a narrow-band response to random excitation is an important parameter in the design of many engineering systems. The response is first represented by an optimum trigonometric polynomial of comparatively small order and then this is used to simulate the process and obtain the distribution of its maximum.

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The above method of finite trigonometric approximation and the well known Karhunen-Loeve expansion are used to derive a method for simulating a Slepian model process and, as an example, the distribution function of its excursion-time above a given level is obtained.

The non-stationary solution of a linear oscillator is treated and a method for its simulation is derived. The distribution function of the excursion-time for a particular example together with its reliability function are calculated.

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