Eidgenössische Technische Hochschule Zürich
Swiss Federal Institute of Technology Zurich

Seminars on Aspects of Integral Risk Management in Engineering

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The distribution of the maximum for a stationary Gaussian process

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A classical problem of extreme value theory is the derivation of maximum distributions for stochastic processes. A standard example is the stationary Gaussian process x(t). Till now the general form of the asymptotic maximum distribution is not completely known.

Assuming that the process has mean 0 and variance 1 and its autocorrelation function r(t) has near zero the form $r(t) = 1 - |t|^{\alpha} + o(|t|^{\alpha})$, $t \to 0$, *with* $0 < \alpha \leq 2$, *the distribution of the maximum is* $P(\max x(t) > u) \approx u^{2/\alpha}\Phi(-u)H_{\alpha}$, $u \to \infty$, *where* $\Phi(.)$ *is the standard normal integral and* H_{α} *(called Pickands constant) is a constant depending only on α. This constant* H_{α} *is known only for α=1 and α=2. Here a simple derivation for this result is given and then the value of* H_{α} *is derived for all values* $0 < \alpha \leq 2$.