A note on the first-passage problem and VanMarcke's approximation - short communication

Abstract:
Given a scalar, stationary, Markov process, this short communication presents a closed-form solution for the first-passage problem for a fixed threshold \( b \). The derivation is based on binary processes and the general formula of Siegert [Siegert AJF. On the first-passage time probability problem. Physical Review 1951; 81:617-23]. The relation for the probability density function of the first-passage time is identical to the commonly used formula that was derived by VanMarcke [VanMarcke E. On the distribution of the first-passage time for normal stationary random processes. Journal of Applied Mechanics ASME 1975; 42:215-20] for Gaussian processes. The present derivation is based on more general conditions and reveals the criteria for the validity of the approximation. Properties of binary processes are also used to derive a hierarchy of upper bounds for any scalar process. (C) 2006 Elsevier Ltd. All rights reserved.

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