Mean level signal crossing rate for an arbitrary stochastic process

The issue of the mean signal level crossing rate for various probability density functions with primary relevance for optics is discussed based on a new analytical method. This method relies on a unique transformation that transforms the probability distribution under investigation into a normal probability distribution, for which the distribution of mean level crossings is known. In general, the analytical results for the mean level crossing rate are supported and confirmed by numerical simulations. In particular, we illustrate the present method by presenting analytic expressions for the mean level crossing rate for various probability distributions, including ones that previously were unavailable, such as the uniform, the so-called gamma-gamma, and the Rice–Nakagami distribution. However, in a limited number of cases the present results differ somewhat from the result reported in the literature. At present, this discrepancy remains unexplained and is laid open for future discussion.

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