Title

Approximate method for computing the sum of independent random variables

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Abstract

There are many mathematical models of scientific and engineering problems in which it is not possible to get exact information about the values of parameters. In this case it is possible to use different models of uncertainty. One of the most popular model of uncertainty is based on the random variables, in particular the sums of the random variables. In order to speed up the calculations of the sum of the independent random variables it is possible to approximate a given probability density by a sum of infinitely divisible random variables and then use the properties of the infinitely divisible distributions in order to calculate the final result. Instead of convolution it is possible to use the product of the characteristic functions. Error estimation can be done by the use of the inverse Fourier transform and the Parseval's theorem. Convergence of the method is guaranteed by the appropriate theorems about polynomial approximation of the continuous function by a sum of fractional polynomials. The method was implemented in the framework of the adaptive computational system and tested on large numbers of examples.