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CLOSED FORM EXPRESSION OF THE QUANTILE FUNCTION OF MAXWELL-BOLTZMANN DISTRIBUTION

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Abstract

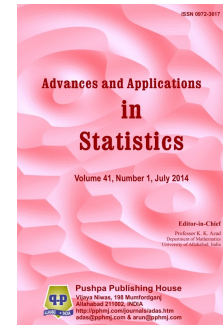
The closed form expression for the quantile function of some distributions is not available because of the intractable nature of the cumulative distribution function and as such inversion method cannot be applied to obtain the quantile function. This paper reports the development of the closed form expressions of the inverse cumulative distribution (quantile) function of Maxwell-Boltzmann distribution by the hybrid combination of quantile mechanics and cubic spline interpolation. The estimated closed form expressions obtained are close to the reference values (R software values) up to an average of 8 decimal places. The result can be adapted and implemented using any mathematical software. The implementation of the results of this paper can create insight into a better use of Maxwell-Boltzmann distribution in statistical mechanics. Now the closed form expression of the quantile function is available to be used in simulation of physical systems described by the distribution. This will change the way and manner physical systems fitted with the Maxwell-Boltzmann distribution are modeled especially in the tail area of the distribution. Furthermore, the parameters can be parameterized to simulate thermal velocity effects.

Keywords and phrases:

simulation, quantile function, Maxwell-Boltzmann, cubic spline, closed form.

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