Monte Carlo Simulation of Inhomogeneous Poisson Ensembles

T. Averina

The Poisson law not only "controls" the points that are randomly distributed in time but also controls ensembles of points that are randomly distributed on a plane or in space with certain intensity. The simulation of Poisson ensembles is needed in many control theory problems, in queuing theory, in risk theory, and in the analysis of constructs in engineering systems.

Algorithms for modeling inhomogeneous Poisson ensembles can be designed on the basis of a majorant of the intensity function using the sequence of rejections, which are usually determined by independent values of a standard random number.

An efficient method was proposed by G. A. Mikhailov for the simulation of random variables whose probability density functions are weighted sums (mixes) of probability densities that can be efficiently modeled. For that purpose, a modified superposition method was proposed by G. A. Mikhailov. This method uses a two-step simulation for the same value of the random number.

In this paper, Mikhailov's method is extended and justified for the multistep case, and it is applied for the simulation of inhomogeneous Poisson ensembles with the use of a sequence of rejections with respect to the same random number. The corresponding modification of the well-known maximum cross-section method is developed, which turns out to be equivalent to the standard algorithm of simulating the generalized geometric distribution.

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