

COMPUTER SIMULATION OF RANDOM PROCESSES

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Many processes in physics, chemistry, biology and medicine are associated with random variables. These processes can be described by mathematical models. It is very convenient to do this with the help of computer software that use random numbers. Examples of such processes:

- passage of particles (protons, neutrons, etc.) through matter;
- reflection of electromagnetic radiation from a rough surface;
- the passage of laser radiation in biological tissue;
- diffusion processes (substance transfer, heat propagation).

Numerous methods have been developed to solve these and other problems, based on the use of random numbers. They are called Monte Carlo methods and are used to calculate nuclear reactors and widely used in geophysics, economics, biology, ecology, etc., in short, to solve problems where analytical or numerical methods for solving do not work because of a high degree of complexity or take a lot of time.

There is an extensive literature in which the solution of such problems is described using Monte-Carlo methods [1–7]. There are random-number generators in mathematical software MATHCAD, MAPLE, MATLAB, STATISTICS, etc. They can be used when applying Monte Carlo methods.

Therefore, it is advisable in the course of mathematics for students of different specialties to consider the possibilities of these methods.

This paper provides examples of the use of random numbers in solving various problems and using some of the Monte Carlo methods.

The goal of the work. Demonstrate the application of the Monte Carlo method in various problems in the classes of probability theory and mathematical statistics. This paper provides examples of the use of random numbers in solving various

problems and using some of the Monte Carlo methods.

Mathcad is used to demonstrate how to solve problems using the Monte Carlo method. The following tasks were investigated:

1. Random number generation
2. Demonstration of random one-dimensional motion of a particle
3. Two-dimensional Brownian motion of a particle. A numerical experiment for checking the Einstein-Smoluchowski equation for diffusion processes
4. Three-dimensional Brownian motion of a particle
5. Calculation of multidimensional integrals.

Conclusion. The possibilities of computer simulation of random processes and the use of the Monte Carlo method using the random number generator of the program MATHCAD, which can be used both in the educational process for demonstration and for solving applied problems, are demonstrated.

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