Numerical Solution of the Rheology Problem

# M & C M, Mag 2, English

1. Random variables. Characteristics. Distribution function. Probability Density Function

(PDF).

1. Main idea of solution of the problem by Monte Carlo methods.
2. Expectation and its property’s.
3. Chebyshev inequality.
4. Variance and its property’s.
5. Random Variable Generation (RVG). Uniformly distributed random variable in interval

. Algorithms.

1. Modeling some discrete integer random variables. Recurrent formula of modeling.
2. Definite integral computing. Variance estimate. Algorithms.
3. Direct modeling (standard method of modeling).
4. Essential sampling method. Theorem.
5. Modeling isotropic vector in three-dimensional space. Algorithms.
6. Discrete Markov chain. Modeling of discrete Markov chains.
7. Homogeneous Markov chain. Initial density , density of probabilities of conversion

, conversion density  and probability of break .

1. Second-order integral equations. Neumann series and its convergence.
2. Homogeneous Markov chains which breaking with probability 1.
3. Solution of the conjugate integral equation.
4. The Solution of the Boundary Value Problem of Poisson and Helmholtz Equations by Monte

Carlo.

1. Green function of Helmholtz operator of the ball.
2. Green function of Laplace operator of the ball.
3. Algorithms “Random walks on spheres”, “Random walks on balls” and “Random walks on

lattices” of Monte Carlo methods.

1. Algorithm of Probability Difference Method.
2. Continuous Markov Chains. Theorem of Variance.
3. The Solution of the Initial Boundary Value Problem of Parabolic Equation by Monte Carlo

and Probability Difference Methods. Continuous Markov Chains. Theorem of Variance.

1. The Solution of the Initial Boundary Value Problem of Hyperbolic Equation by Monte Carlo

and Probability Difference Methods. Continuous Markov Chains. Theorem of Variance.

1. 1. A model of classical elastic filtration. Algorithms of Monte Carlo methods and

Probability Difference Method.

1. 2. The simplest model of filtration with a constant speed of disturbance spread. Algorithms

of Monte Carlo methods and Probability Difference Method.

1. 3. Filtration model in relaxationaly-compressed porous environment realized by the linear

Darcy law. Algorithms of Monte Carlo methods and Probability Difference Method.

1. 4. Model of filtration by the simplest unbalanced law in elastic porous environment.

Algorithms of Monte Carlo methods and Probability Difference Method.

1. Mathematical Models of Filtration Process. Musket – Leverett’s Model. Algorithms of Monte

Carlo methods/

1. Mathematical Models of Aero- Hydromechanics. Navier – Stokes Equations. Algorithms of Monte

Carlo methods.

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