
Contents

Introduction	ix
Chapter 1. The Distribution of the Estimates for the Norm of Sub-Gaussian Stochastic Processes	1
1.1. The space of sub-Gaussian random variables and sub-Gaussian stochastic processes	2
1.1.1. Exponential moments of sub-Gaussian random variables	8
1.1.2. The sum of independent sub-Gaussian random variables	9
1.1.3. Sub-Gaussian stochastic processes	10
1.2. The space of strictly sub-Gaussian random variables and strictly sub-Gaussian stochastic processes	15
1.2.1. Strictly sub-Gaussian stochastic processes	22
1.3. The estimates of convergence rates of strictly sub-Gaussian random series in $L_2(T)$	24
1.4. The distribution estimates of the norm of sub-Gaussian stochastic processes in $L_p(T)$	28
1.5. The distribution estimates of the norm of sub-Gaussian stochastic processes in some Orlicz spaces	30
1.6. Convergence rate estimates of strictly sub-Gaussian random series in Orlicz spaces	34
1.7. Strictly sub-Gaussian random series with uncorrelated or orthogonal items	42
1.8. Uniform convergence estimates of sub-Gaussian random series	48
1.9. Convergence estimate of strictly sub-Gaussian random series in $C(T)$	58
1.10. The estimate of the norm distribution of L_p -processes	69

Chapter 2. Simulation of Stochastic Processes Presented in the Form of Series	71
2.1. General approaches for model construction of stochastic processes	71
2.2. Karhunen–Loève expansion technique for simulation of stochastic processes	73
2.2.1. Karhunen–Loève model of strictly sub-Gaussian stochastic processes	74
2.2.2. Accuracy and reliability of the KL model in $L_2(T)$	75
2.2.3. Accuracy and reliability of the KL model in $L_p(T)$, $p > 0$	75
2.2.4. Accuracy and reliability of the KL model in $L_U(T)$	77
2.2.5. Accuracy and reliability of the KL model in $C(T)$	79
2.3. Fourier expansion technique for simulation of stochastic processes	84
2.3.1. Fourier model of strictly sub-Gaussian stochastic process	85
2.3.2. Accuracy and reliability of the F-model in $L_2(T)$	85
2.3.3. Accuracy and reliability of the F-model in $L_p(T)$, $p > 0$	86
2.3.4. Accuracy and reliability of the F-model in $L_U(T)$	88
2.3.5. Accuracy and reliability of the F-model in $C(T)$	90
2.4. Simulation of stationary stochastic process with discrete spectrum	93
2.4.1. The model of strictly sub-Gaussian stationary process with discrete spectrum	94
2.4.2. Accuracy and reliability of the $D(T)$ -model in $L_2(T)$	95
2.4.3. Accuracy and reliability of the $D(T)$ -model in $L_p(T)$, $p > 0$	95
2.4.4. Accuracy and reliability of the $D(T)$ -model in $L_U(T)$	97
2.4.5. Accuracy and reliability of the $D(T)$ -model in $C(T)$	101
2.5. Application of Fourier expansion to simulation of stationary stochastic processes	102
2.5.1. The model of a stationary process in which a correlation function can be represented in the form of a Fourier series with positive coefficients	103
Chapter 3. Simulation of Gaussian Stochastic Processes with Respect to Output Processes of the System	105
3.1. The inequalities for the exponential moments of the quadratic forms of Gaussian random variables	107
3.2. The space of square-Gaussian random variables and square-Gaussian stochastic processes	116
3.3. The distribution of supremums of square-Gaussian stochastic processes	117
3.4. The estimations of distribution for supremum of square-Gaussian stochastic processes in the space $[0, T]^d$	126

3.5. Accuracy and reliability of simulation of Gaussian stochastic processes with respect to the output process of some system	133
3.6. Model construction of stationary Gaussian stochastic process with discrete spectrum with respect to output process	144
3.7. Simulation of Gaussian stochastic fields	157
3.7.1. Simulation of Gaussian fields on spheres	161
Chapter 4. The Construction of the Model of Gaussian Stationary Processes	169
Chapter 5. The Modeling of Gaussian Stationary Random Processes with a Certain Accuracy and Reliability	181
5.1. Reliability and accuracy in $L_p(\mathbf{T})$, $p \geq 1$ of the models for Gaussian stationary random processes	181
5.1.1. The accuracy of modeling stationary Gaussian processes in $L_p([0, T])$, $1 \leq p \leq 2$	182
5.1.2. The accuracy of modeling stationary Gaussian processes $L_p([0, T])$ at $p \geq 1$	188
5.1.3. The accuracy of modeling Gaussian stationary random processes in norms of Orlicz spaces	199
5.2. The accuracy and reliability of the model stationary random processes in the uniform metric	202
5.2.1. The accuracy of simulation of stationary Gaussian processes with bounded spectrum	202
5.2.2. Application of $L_p(\Omega)$ - processes theory in simulation of Gaussian stationary random processes	213
5.3. Application of $Sub_\varphi(\Omega)$ space theory to find the accuracy of modeling for stationary Gaussian processes	222
5.4. Generalized model of Gaussian stationary processes	241
Chapter 6. Simulation of Cox Random Processes	251
6.1. Random Cox processes	251
6.2. Simulation of log Gaussian Cox processes as a demand arrival process in actuarial mathematics	253
6.3. Simplified method of simulating log Gaussian Cox processes	268
6.4. Simulation of the Cox process when density is generated by a homogeneous log Gaussian field	280
6.5. Simulation of log Gaussian Cox process when the density is generated by the inhomogeneous field	286
6.6. Simulation of the Cox process when the density is generated by the square Gaussian random process	292
6.7. Simulation of the square Gaussian Cox process when density is generated by a homogeneous field	299

6.8. Simulation of the square Gaussian Cox process when the density is generated by an inhomogeneous field	301
Chapter 7. On the Modeling of Gaussian Stationary Processes with Absolutely Continuous Spectrum	305
Chapter 8. Simulation of Gaussian Isotropic Random Fields on a Sphere	315
8.1. Simulation of random field with given accuracy and reliability in $L_2(S_n)$	323
8.2. Simulation of random field with given accuracy and reliability in $L_p(S_n), p \geq 2$	324
Bibliography	325
Index	333