Karachanskaya E. V. (Khabarovsk, Russia) **Indicator random processes and its applications**

Modeling of diffusion processes with jumps is a pressing problem, since many applied problems are described by similar models. It is proposed to consider stochastic equations with a variable structure based on indicator random processes.

A random process $\chi(t)$ is called an *indicator random process* if it takes only two values: 1 or 0.

Two and more random processes $\xi_1(t), \xi_2(t), ...$, are called *incompatible processes* if for every $t \geqslant 0$ only one process from this collection is nonzero:

$$\begin{array}{ll} \xi_{k_1}(t_1) \neq 0, & \xi_j(t_1) = 0, \quad \forall\, j \neq k_1; \\ \xi_{k_2}(t_2) \neq 0, & \xi_j(t_2) = 0, \quad \forall\, j \neq k_2; \\ & \dots \end{array}$$

Lemma. Let $\chi_j(t)$, $j = 1, 2, \dots, n-1$, be independent indicator random processes. Then the random processes

$$z_1(t) = \chi_1(t); \quad z_k(t) = \chi_k(t) \prod_{j=1}^{k-1} (1 - \chi_j(t)), \quad k = 2, 3, \dots, n-1; \quad z_n(t) = \prod_{j=1}^{n-1} (1 - \chi_j(t)),$$

form a complete group of incompatible processes for every $t \geqslant 0$.

Using a given set of incompatible processes that form the complete group, and knowing their probabilities, one can proceed to constructively specifying the realizations of random processes with variable structure.

Theorem. Let the following be given: a collection of independent set-events A_j, $j = 1, 2, \dots, n-1$ and a complete group of incompatible events B_j, $j = 1, 2, \dots, n$:

$$B_1 = \mathrm{A}_1; \qquad \mathrm{B}_j = \mathrm{A}_j \bigcap \left(\bigcap_{k=1}^{j-1} \bar{\mathrm{A}}_k \right), \quad j = 2, 3, \dots, n-1; \qquad \mathrm{B}_n = \bigcap_{k=1}^{n-1} \bar{\mathrm{A}}_k.$$

Let us assume that a set of probabilities is given:

$$P(\mathrm{B}_j), \quad j = 1, 2, \dots, n-1; \qquad P(\mathrm{B}_n) = 1 - \sum_{j=1}^{n-1} P(\mathrm{B}_j).$$

Then it is possible to establish a one-to-one correspondence between the sets $P(\mathrm{A}_j)$ and $P(\mathrm{B}_r)$, $r, j = 1, 2, \dots, n-1$.