Fedotkin M.A., Zorine A.V. (Nizhni Novgorod, Russia) — **Stochastic models for adaptive control processes for conflicting flows of nonhomogeneous customers.**

In this talk, some methods for mathematical and simulation modeling and analysis of control processes for flows of nonhomogeneous customers are collected, those which have been developed at the Lobachevsky State University of Nizhni Novgorod. The methods are based on a notion of an *abstract stochastic control system* introduced by Lyapunov and Yablonsky [1]. In this approach the following principles should be held: discreteness of the control system's operation acts, non-locality in the control system's blocks description. A control systems consists of 1) a block for input flows formation, 2) the input flows Π_1, Π_2, …, $\Pi_{\widehat{m}}$, $1 \leqslant \widehat{m} < \infty$, and saturation flows Π_1^{sat}, Π_2^{sat}, …, Π_m^{sat}, $1 \leqslant m < \infty$, 3) queues O_1, O_2, …, O_m, 4) a block for service strategy mechanism, 5) a server, 6) a flows control algorithm, 7) output flows Π_1^{out}, Π_2^{out}, …, Π_m^{out}. Let an increasing sequence $\{\tau_i, i = 0, 1, \ldots\}$ define a scale of observation instants of time. The following random variables should be defined related to the time interval $(\tau_i, \tau_{i+1}]$: χ_i denoting the state of the block for input flows formation, a vector η_i of arrival counts from the input flows, a vector ξ_i of counts of customers in the saturation flows, and a vector $\bar{\xi}_i$ of exiting customers counts. A server state variable Γ_i and a queue sizes vector κ_i correspond to the instant of time τ_i. Then a random vector-valued sequence

$$\{(\tau_i, \chi_i, \eta_i, \xi_i, \Gamma_i, \kappa_i, \bar{\xi}_i), i = 0, 1, \ldots\}$$

is a mathematical model for the control process for conflicting flows.

In papers [2–5] some properties of the vector-valued sequence

$$\{(\chi_i, \Gamma_i, \kappa_i, \bar{\xi}_i), i = 0, 1, \ldots\} \tag{1}$$

are studied. For example, necessary and sufficient conditions for the stationary distribution existence for the sequence (1), given some constraints for the marginal probability distributions of the vector sequence $\{(\tau_i, \eta_i, \xi_i), i = 0, 1, \ldots\}$, are given in these papers.

The proposed approach allows to find constraints on the conflicting flows control process parameters under which there exists a stationary regime. Also, it becomes possible to determine quasi-optimal parameter values subject to minimization of the mean sojourn time of an arbitrary customer in the system by means of computer-aided simulation.

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