# On the Error of Calculating the Reachable Values of Objective Functionals for Control Systems with Continuous and Discrete Times

## V. P. Maksimov[1]

**Abstract**—For a wide class of linear systems with aftereffect, the problem of attaining a given system of target values is considered under polyhedral constraints on the control. The aim of the control is set by a finite system of linear functionals $\ell_i$, $i = 1, \ldots, N$; this is why the more precise term "$\ell$-attainability" is used in the paper. The general form of the functionals makes it possible to consider terminal, multipoint, and integral target conditions and their linear combinations as special cases. For the class of systems under consideration, the problem of $\ell$-attainability is reduced to a variant of the moment problem. One of the features of this problem is the account of random perturbations in elements of the moment matrix. These perturbations result in the distortion of the lower and upper (with respect to inclusion) approximations of the $\ell$-attainable set. To obtain a guaranteed result, special procedures are proposed, which allow one to build open-loop controls with the following properties. First, the implementation of such controls produces trajectories on which the objective functionals take reachable values. Second, the calculation of reachable values is accompanied by guaranteed estimates of the errors associated with perturbations of elements of the moment matrix. In this case, each coordinate of the vector of target values corresponds not only to an interval of feasible values but also to the corresponding probability density of their distribution. The latter property allows one to give probabilistic characteristics to the errors.

**Keywords:** control problems, continuous–discrete systems with aftereffect, control with constraints, reachable sets.

[1]Perm State National Research University, Perm, 614990 Russia
e-mail: maksimov@econ.psu.ru