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On guarantee optimization in control problem with finite set of disturbances. (English)

Zbl 1483.49046

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Summary: In this paper, we deal with a control problem under conditions of disturbances, which is stated as a problem of optimization of the guaranteed result. Compared to the classical formulation of such problems, we assume that the set of admissible disturbances is finite and consists of piecewise continuous functions. In connection with this additional functional constraint on the disturbance, we introduce an appropriate class of non-anticipative control strategies and consider the corresponding value of the optimal guaranteed result. Under a technical assumption concerning a property of distinguishability of the admissible disturbances, we prove that this result can be achieved by using control strategies with full memory. As a consequence, we establish unimprovability of the class of full-memory strategies. A key element of the proof is a procedure of recovering the disturbance acting in the system, which allows us to associate every non-anticipative strategy with a full-memory strategy providing a close guaranteed result. The paper concludes with an illustrative example.

MSC:

49N30 Problems with incomplete information (optimization)

49N35 Optimal feedback synthesis

93C15 Control/observation systems governed by ordinary differential equations

Keywords:

control problem under disturbances; optimal guaranteed result; non-anticipative strategy; full-memory strategy; recovery of disturbances; unimprovability

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