

Asymptotics of a Solution to an Optimal Control Problem with a Terminal Convex Performance Index and a Perturbation of the Initial Data

A. R. Danilin^{1,*} and O. O. Kovrizhnykh^{1,2,**}

Received March 9, 2023; revised April 13, 2023; accepted April 17, 2023

Abstract—In this paper, we investigate a problem of optimal control over a finite time interval for a linear system with constant coefficients and a small parameter in the initial data in the class of piecewise continuous controls with smooth geometric constraints. We consider a terminal convex performance index. We substantiate the limit relations as the small parameter tends to zero for the optimal value of the performance index and for the vector generating the optimal control in the problem. We show that the asymptotics of the solution can be of complicated nature. In particular, it may have no expansion in the Poincaré sense in any asymptotic sequence of rational functions of the small parameter or its logarithms.

Keywords: optimal control, terminal convex performance index, asymptotic expansion, small parameter.

DOI: 10.1134/S008154382306007X

¹Krasovskii Institute of Mathematics and Mechanics, Ural Branch of the Russian Academy of Sciences, Yekaterinburg, 620108 Russia

²Ural Federal University, Yekaterinburg, 620000 Russia
e-mail: *dar@imm.uran.ru, **koo@imm.uran.ru