Asymptotics of a Solution to an Optimal Control Problem with Integral Convex Performance Index, Cheap Control, and Initial Data Perturbations

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Abstract—We consider an optimal control problem in the class of piecewise continuous controls with smooth geometric constraints for a linear system with constant coefficients and an integral convex performance index containing two small parameters (the first of them multiplying the integral term, and the second in the initial data). Such problems are called cheap control problems. It is shown that the limit problem is a problem with terminal performance index. It is established that if the limit problem is actually one-dimensional whereas the initial problem is not, then the asymptotics of the solution can be more complicated. In particular, the asymptotics of the solution may have no expansion in the Poincare sense in any asymptotic sequence of rational functions of the small parameter or its logarithms.

Keywords: optimal control, cheap control, asymptotic expansion, small parameter.

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