

Sannuti, Peddapullaiah; Wason, Harvinder Singh

Multiple time-scale decomposition in cheap control problems - singular control. (English)

Zbl 0563.93015

IEEE Trans. Autom. Control 30, 633-644 (1985).

The paper presents a solution to the well-known problem of asymptotic characterization of the cheap control, i.e. the function that minimizes $J = \int_0^T (y'y + \mu^2 u'Ru)$ subject to $\dot{x} = Ax + Bu, y = Cx$ where μ is a small scalar parameter. Applying own earlier results [Int. J. Control 37, 1259-1286 (1983; Zbl 0525.93012)] the authors transform the problem into a multiparameter singular perturbation problem: minimize $J = \int_0^T (x'_f C'_f C_f x_f + u'Ru)$ subject to $\dot{x}_0 = A_0 x_0 + A_{0f} x_f, \epsilon \dot{x}_f = A_f x_f + A_{f0} x_0 + B_f u, (break?) = C_f x$ where the matrices C_f, A_f etc. are determined in an appropriate way. Then, using singular perturbation techniques an asymptotic solution of the corresponding Riccati equation is derived. On that basis, the behaviour of the optimal feedback poles, state and control trajectory, and the optimal transfer function as $\mu \rightarrow 0$ are investigated. Besides its mathematical value, the obtained result has an important practical meaning: it gives a method for decomposition of the cheap regulator problem into several low dimensional regulator problems.

Reviewer: [A.Dontchev](#)

MSC:

[93B17](#) Transformations

[34E15](#) Singular perturbations for ordinary differential equations

[49M27](#) Decomposition methods

[93C05](#) Linear systems in control theory

Cited in **10** Documents

Keywords:

[cheap control](#); [multiparameter singular perturbation problem](#); [decomposition](#)

Full Text: [DOI](#)