Osypova, O. V.; Pertsov, A. S.; Cherevko, I. M.
Decomposition and stability of linear singularly perturbed systems with two small parameters. (English) Zbl 07382426

Summary: In the domain $\Omega = \{(t, \varepsilon_1, \varepsilon_2) : t \in \mathbb{R}, \varepsilon_1 > 0, \varepsilon_2 > 0\}$, we consider a linear singularly perturbed system with two small parameters

$$\begin{align*}
\dot{x}_0 &= A_{00}x_0 + A_{01}x_1 + A_{02}x_2, \\
\varepsilon_1 \dot{x}_1 &= A_{10}x_0 + A_{11}x_1 + A_{12}x_2, \\
\varepsilon_1 \varepsilon_2 \dot{x}_2 &= A_{20}x_0 + A_{21}x_1 + A_{22}x_2,
\end{align*}$$

where $x_0 \in \mathbb{R}^{n_0}$, $x_1 \in \mathbb{R}^{n_1}$, $x_2 \in \mathbb{R}^{n_2}$. In this paper, schemes of decomposition and splitting of the system into independent subsystems by using the integral manifolds method of fast and slow variables are investigated. We give the conditions under which the reduction principle is truthful to study the stability of zero solution of the original system.

MSC:

34A30 Linear ordinary differential equations and systems
34C45 Invariant manifolds for ordinary differential equations
34D15 Singular perturbations of ordinary differential equations
34E15 Singular perturbations for ordinary differential equations
37D10 Invariant manifold theory for dynamical systems

Keywords:
singularly perturbed system; decomposition; splitting; stability; integral manifold

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References:


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