Singularly perturbed linear boundary value problems

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Abstract

In this paper an alternative approach to the method of asymptotic expansions for the study of a singularly perturbed linear system with multiparameters and multiple time scales is developed. The method consists of developing a non-singular linear transformation that transforms an arbitrary n-time scale system into diagonal form. This fast and slow mode decomposition provides a modern technique to find an approximate solution of the original system in terms of the solution of an auxiliary system corresponding to the decoupled system. Furthermore, the decoupled system provides a useful mechanism to relate the asymptotic behavior of the solution of the original system and the solution of the degenerate system relative to the original system.