Some comparisons between MMAE and SCEM for solving singularly perturbed linear problems

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Abstract

In this study, we propose an efficient method so-called Successive Complementary Expansion Method (SCEM) for approximating to the solutions of singularly perturbed two-point boundary value problems. In this efficient asymptotic method, in contrast to the well-known method the Method of Matched Asymptotic Expansions (MMAE), the matching process is not necessary to obtain uniformly valid approximations. The key point: A uniformly valid approximation is adopted first, and complementary functions are obtained imposing the corresponding boundary conditions. MMAE results are given in order to compare the numerical robustness of the methods. Numerical results and the comparisons demonstrate absolute superiority of SCEM to MMAE for linear problems.

Keywords: Singular perturbation, Successive complementary expansion method, Uniformly valid approximation.

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