High-accurate method for solving the Orr-Sommerfeld stability equation

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Abstract

An effective method for computing eigenfunctions and eigenvalues of the Orr-Sommerfeld equation for stability analysis of the Poiseuille or Couette flow is developed. The method is based on the system of expansions for the eigenfunctions, on

the using of Pade-approximants and on a smooth matching of the expansions. Large values of the Reynolds number R are studied ($R > 10^4$). This case is correspond to singular perturbation of the equation. Effective symbolic evaluations are used for

high-accurate computing the coefficients of expansions, for studying their asymptotics, for convergence acceleration and for the optimal matching. New numerical results on the behavior of the eigenvalues in the complex-plane are obtained for large values of the Reynolds number.

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