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The FD-method for solving Sturm-Liouville problems with special singular differential operator

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In the paper we describe a superexponentially convergent numerical-analytical method for solving the eigenvalue problem for the some class of singular differential operators with boundary conditions. The method (FD-method) was firstly proposed by V. L. Makarov and successfully combines the benefits of using the {\it coefficient approximation methods} (CAM) and the homotopy approach. The sufficient conditions which provides convergence of the proposed method are stated and rigorously substantiated. The algorithm for the software implementation of the proposed method is described too. A lot of numerical examples are included in the paper. The examples confirm the theoretical conclusions. We also have made the comparison between the results obtained by FD-method and results obtained by the powerful software package for solving Sturm-Liouville problems --- SLEIGN2.

Submission history

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