

Spectral Collocation Solutions to Eigenproblems on Unbounded Domains

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The aim of this communication is to argue that spectral collocation based on Laguerre (LGRC), Hermite (HC) as well as Sinc (SiC) functions offers reliable and accurate solutions to a large class of eigenvalue problems on unbounded domains.

We consider non-standard eigenvalue problems, singular and/or self-adjoint as well as eigenproblems supplied with boundary conditions depending on eigenparameter ([2]). Recently we have obtained important results concerning eigenvalue problems with transmission conditions.

In order to estimate the accuracy of outcomes we display the behavior (the decreasing way) of the expansion coefficients of solutions. Because this method works in physical space, to get these coefficients in the spectral space we make use of the FFT or another polynomial transforms ([1]). To the same aim we compute the relative drift of a specified set of eigenvalues. The orthogonality of eigenvectors is another way we assess the accuracy of our computations.

The communication will be illustrated with a large number of figures and tables. They underline the efficiency of spectral collocation methods used to solve eigenproblems on unbounded domains.

Bibliography

- [1] Boyd, J.P., *Traps and Snares in Eigenvalue Calculations with Application to Pseudospectral Computations of Ocean Tides in a Basin Bounded by Meridians*, J. Comput. Phys. **126**, 11-20 (1996)
- [2] Gheorghiu, C.I., *Spectral Collocation Solutions to Problems on Unbounded Domains*, Casa Cărţii de Ştiinţă Publishing House, Cluj-Napoca, 2018 (see <https://ictp.acad.ro/gheorghiu/papers>)