

MATSLISE, a Matlab package for solving Sturm-Liouville and Schrodinger equations

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SUMMARY

Matslise [1] is a graphical Matlab software package for the interactive numerical study of Sturm-Liouville problems (SLPs), which can generally be written as

$$(p(x)y'(x))' + q(x)y(x) = Ew(x)y(x) \quad x \in (a, b)$$

The package allows the fast and accurate computation of the eigenvalues E and the visualization of the corresponding eigenfunctions y . It is built upon high-order piecewise constant perturbation methods, also called the CP methods. Many researchers, in particular the ones from applied fields, prefer to use the user friendly problem solving environment Matslise over Fortran subroutines, like SLEDGE and SLEIGN2, although these latter packages can deal with a larger range of singular problems.

Currently we are working on a successor code Matslise 2.0. This new release is developed to work for a broad class of singular problems. This is realized by including the recent extension of the CP algorithm from problems in Liouville normal form to the general Sturm-Liouville form and by using specially adapted algorithms in a narrow interval around the singularity.

In the present talk, I will focus on some important ideas that have lead to the success of the Matslise package, such as shooting, coefficient approximation, perturbative corrections, the Liouville transformation, the Prüfer transformation, ... and some new ideas that are included in the new release.

Keywords:

AMS Classification:

References

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- [2] V. LEDOUX AND M. VAN DAELE. Solving Sturm-Liouville problems by piecewise perturbation methods, revisited. *Comp. Phys. Commun.* **181**, 1335-1345, 2010.

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