JOHANNES KEPLER UNIVERSITY LINZ

Johannes Kepler University Linz
Institute of Numerical Mathematics
Univ.-Prof. Dr. Herbert Egger

NUMA
INSTITUTE OF NUMERICAL MATHEMATICS

Talk announcement

Martin Halla
(Univ. Göttingen)

Tuesday, Oct 31, 2023
15:30, S2 416-1

Eigenvalue problems and compatible approximations

In the first part of my talk I will introduce the audience to the approximation of eigenvalue problems for holomorphic Fredholm operator functions [1]. The approximation of operators having the form "coercive+compact" is fairly well understood, but the approximation of operators which don't fit this form is delicate and challenging. I will present a framework [2] with which the analysis from the continuous level can be mimiced on the discrete level to prove the convergence of approximations. Applications of this framework include Maxwells equations, mixed systems, the equations of stellar oscillations and perfectly matched layer approximations of resonance problems [3,4,5]. In a second part I will talk about the role of transmission/target eigenvalues [2] in inverse scattering.I will present a new approach to construct methods for which the sensitivity of the target eigenvalues can be tuned arbitrarily.

[1] Karma: Approximation in eigenvalue problems for holomorphic Fredholm operator functions. I. Numer. Funct. Anal. Optimization 17, No. 3-4, 365-387 (1996)

[2] Halla: Galerkin approximation of holomorphic eigenvalue problems: weak T-coercivity and T-compatibility. Numer. Math. 148, No. 2, 387-407 (2021)

[3] Halla: On the approximation of dispersive electromagnetic eigenvalue problems in two dimensions, IMA Journal of Numerical Analysis 43(1), 535–559 (2023).

[4] Halla: Analysis of radial complex scaling methods: Scalar resonance problems, SIAM J. Numer. Anal. 59(4), 2054–2074 (2021)

[5] Halla, Lehrenfeld, Stocker, A new T-compatibility condition and its application to the discretization of the damped time-harmonic Galbrun's equation, arXiv 2209.01878, (2022)

[6] Cakoni, Colton, Haddar: Inverse scattering theory and transmission eigenvalues, 2nd edition, CBMS-NSF Regional Conference Series in Applied Mathematics 98, SIAM Philadelphia (2023).