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On smoothers for the multigrid of the second kind

In this talk, we present our study on smoothers for the multigrid method of the second kind arising from Fredholm integral equations. Our model problems use nonlocal governing operators that enforce local boundary conditions. For discretization we utilize the Nyström method with the Trapezoidal Rule. We find the eigenvalues of matrices associated to periodic, antiperiodic and Dirichlet problems in terms of nonlocality parameter and mesh size. Knowing explicitly the spectrum of the matrices enables us to analyze the behavior of smoothers. Although spectral analyses exist for finding effective smoothers for 1D elliptic model problems, to the best of our knowledge, a guiding spectral analysis is not available for smoothers of multigrid of the second kind. We fill this gap in the literature.

The Picard iteration has been the default smoother for multigrid of the second kind. Jacobi-like methods have not been considered as viable options. We propose two strategies. The first one focuses on the most oscillatory mode and aims to damp it effectively. For this choice, we show that weighted-Jacobi relaxation is equivalent to the Picard iteration. The second strategy focuses on the oscillatory modes and aims to damp them as quickly as possible, simultaneously. Although the Picard iteration is an effective smoother for model nonlocal problems under consideration, we show that it is possible to find better than ones using the second strategy. We also shed some light on internal mechanism of the Picard iteration and provide an example where the Picard iteration cannot be used as a smoother.

Ort: Raum 30.02.003 (2. Stock) (Mathegeb. 30 West)   Zeit: Freitag, 12.10.2018, 12:15 Uhr

Zu diesem Vortrag laden wir Sie herzlich ein.

gez. Prof. Dr. Alfio Borzì
gez. Prof. Dr. Bernadette Hahn