

Department of
Mathematics and Statistics

Colloquium

Parallel FFT-type preconditioning for Krylov subspace iterative algorithms



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Friday

October 4, 2019

PS 307

4:00 pm

The recent development of parallel CPU technologies on modern desktop computers makes sequential numerical algorithms a thing of the past. It is obvious that the main performance improvement in the upcoming years will be made based on the increasing number of cores on modern PCs. It shifts the focus of the algorithmic research from the development of the sequential numerical methods to the parallel methodology.

In this presentation, we discuss efficient parallel iterative approaches to the solution of the discrete three-dimensional Helmholtz equation with variable coefficients and different types of boundary conditions based on the compact second, fourth and sixth order approximation schemes. The coefficient matrices of the resulting systems are not Hermitian and possess positive as well as negative eigenvalues so represent a significant challenge for constructing an efficient iterative solver. In our approach, these systems are solved by a combination of a Krylov subspace-type method with low and high order FFT preconditioners.

The resulting numerical methods allow efficient implementation on parallel computers. The results of the implementation of these methods in OpenMP, MPI and Hybrid programming environment will be discussed.

For colloquium attendees, there will be light refreshments in PS 317, from 3:30 – 4:00 pm