

15th International Conference on Domain Decomposition Methods
July 21-25, 2003, Berlin, Germany

Domain Decomposition Preconditioners for Spectral Nedelec Elements in Two and Three Dimensions

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Abstract: In previous work, we proposed overlapping Schwarz preconditioners for the model problem

$$\alpha(\mathbf{u}, \mathbf{v}) + \beta(\mathbf{curl} \mathbf{u}, \mathbf{curl} \mathbf{v}) = \mathbf{f}(\mathbf{u})$$

discretized by high-order spectral versions of Nédélec elements and presented a theoretical analysis and experiments in two dimensions.

Our implementation included fast matrix-vector multiplies and fast solvers using the block sum of tensorproduct structure of the discretization. This allows the implementation of spectral methods and the use of elements of very high order (up to 50-100 in each direction).

We have now used these building blocks to implement iterative substructuring preconditioners for the two-dimensional case and have extended the fast matrix-vector multiply and the fast solvers to the three-dimensional case, and used it to implement domain decomposition preconditioners in the three-dimensional case. We will present numerical experiments for these methods in two and three dimensions.

We have also extended and simplified our analysis of the overlapping methods and will present some theoretical and numerical results for the analysis of iterative substructuring methods.

Type of contribution: Talk

Location: Room 005, **Time:** Thursday, 24 July, 12:00

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