A FAST FOURIER TRANSFORM BASED DIRECT SOLVER FOR THE HELMHOLTZ PROBLEM

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ABSTRACT

In this talk, we consider the derivation and application of a fast direct solver employing fast Fourier transform (FFT) in order to solve the Helmholtz equation. We discuss the method for solving the Helmholtz equation in a two- or three-dimensional rectangular domain with an absorbing boundary condition, see [2]. The Helmholtz problem is discretized by standard bilinear and trilinear finite elements on an orthogonal mesh yielding a separable system of linear equations. We present numerical results for two- and three-dimensional problems solved by the FFT based direct solver. This is a joint work with Jari Toivanen (University of Jyväskylä, Finland).

REFERENCES

[1] T. Rossi and J. Toivanen, *A nonstandard cyclic reduction method, its variants and stability*, SIAM J. Matrix Anal. Appl., 20 (1999), pp. 628–645.

[2] E. Heikkola, T. Rossi, and J. Toivanen, *Fast direct solution of the Helmholtz equation with a perfectly matched layer or an absorbing boundary condition*, Internat. J. Numer. Methods Engrg., 57 (2003), pp. 2007–2025.

[3] J. Toivanen and M. Wolfmayr, *A fast Fourier transform based direct solver for the Helmholtz problem*, to appear soon, 2018.