Exact Sciences Seminar
Monday 23.03.20 Monday on 16:00-17:00, Ficus 303

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Block Finite Difference Methods and their Relation to Finite Element Methods

Abstract

Finite Difference methods (FD) are one of the oldest and simplest methods used for solving differential equations.
In the classical FD method the same stencil is used at each grid point and the orders of the global error and the truncation error are the same. Block Finite Difference methods (BFD) are FD methods in which the domain is divided into blocks, or cells, containing two or more grid points with a different scheme used for each grid point, unlike the standard FD method. In this approach, the interaction between the different truncation errors and the dynamics of the scheme may inhibits the error from growing, hence error reduction is obtained, leading to a more efficient method.
On the other hand, the Finite Element method (FE) consists in finding an approximation of the solution in a certain form, usually a linear combination of a set of chosen trial functions.
The Discontinuous Galerkin (DG) method is a class of FE method using a completely discontinuous polynomial space for the approximation of the solution and trial functions. We first show that our BFD scheme can be viewed as a DG scheme, proving stability during the process. Then, performing a Fourier like analysis, we prove optimal convergence of the BFD scheme.

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