**Johann Radon Institute for
Computational and Applied Mathematics
Austrian Academy of Sciences (ÖAW)**

Group Seminar

Computational Methods for PDEs

A unified convergence theory for Robin-Schwarz methods - continuous and discrete, including crosspoints

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Tuesday, March 16, 2021, 15:30
ZOOM

Abstract

This talk deals with non-overlapping domain decomposition methods for wave propagation problems, more precisely, Schwarz methods with generalized Robin transmission conditions, as they were introduced by Bruno Després in 1990. These methods solve a global wave propagation problem iteratively, by solving local subdomain problems in each step in parallel and communicating data across subdomain interfaces. An abstract framework is presented that includes and extends the existing theory. The framework is applicable to general wave propagation problems in variational form, either in the continuous case, involving Sobolev spaces, or in the discrete case, involving suitable finite element spaces.

Until only recently, a key difficulty were decompositions with crosspoints (points shared by more than two subdomains). In the continuous case, regularity of the solution is needed to show convergence, and the convergence cannot shown to be geometric. This difficulty can be overcome by a technique introduced by X. Claeys in 2020, and I will show how this works in a general context. The key ingredient is a global interface exchange operator which allows geometric convergence without any regularity requirements.

In the discrete case, crosspoints can lead to complications too, and there are several ways how to deal with them, e.g., the FETI-2LM method (introduced by de La Bourdonnaye, Farhat, Macedo, Magoulés, and Roux in 1997), the 2-Lagrange-multiplier method (introduced by S. Loisel in 2013), and two approaches suggested by Gander and Santugini in 2016. I will briefly explain and compare these variants. When applying Claeys' technique to the discrete case, one obtains a scheme that can be viewed as a generalization of Loisel's method.

Finally, I will briefly discuss a novel idea of localizing the discrete exchange operator while still preserving its essential properties.

online: ZOOM

Tue, Mar 16, 2021 03:30 PM (CET)

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