Pressure robust discretizations of the Stokes equations

Spring 2023

Overview

The course is intended to introduce recent developments on the discretization of the Stokes equations with the finite element methods. The students are expected to have a basic knowledge on elliptic partial differential equations and their finite element discretization.

Abstract

In the last decades, most research activity on the discretization of the Stokes equations has been devoted to the design of methods combining suitable stability and approximation properties. This has been made possible in a systematic way since the pioneering work of Brezzi, who identified necessary and sufficient conditions for this purpose. More recently, the task of ensuring the above-mentioned properties while partially preserving the structure of the equations has attracted a growing attention. In particular, the importance of the so-called pressure robustness introduced by Linke has been observed in several contexts. The course aims at introducing this notion, motivating its relevance and reviewing the techniques that have been developed to enforce it. If necessary, and/or required, classical discretization of the Stokes equations as well as related topics might be discussed, such as the inf-sup theory, nonstandard finite element methods and preconditioning for saddle point problems.

Schedule

1.	Inf-sup theory	27/04	11-13	Room C29 – UniPV
2.	Approximation	02/05	11-13	Room C29 – UniPV
3.	Stokes equations	04/05	11-13	Room C29 – UniPV
4.	Regularity	09/05	11-13	Room C29 – UniPV
5.	Stable discretizations	11/05	11-13	Room C29 – UniPV
6.	Solvers	16/05	11-13	Room C29 – UniPV
7.	A posteriori estimation	18/05	11-13	Room C29 – UniPV
8.	Pressure robustness	23/05	11-13	Room C29 – UniPV
9.	Conforming and div-free discretizations	25/05	11-13	Room C29 – UniPV
10.	Stream functions	30/05	11-13	Room C29 – UniPV
11.	Hdiv-conforming discretizations	01/06	11-13	Room C29 – UniPV
12.	Modified right-hand side	06/06	11-13	Room C29 – UniPV
13.	A posteriori estimation revisited	08/06	11-13	Room C29 – UniPV
14.	Quasi-optimality	13/06	11-13	Room C29 – UniPV

Shared folder

https://drive.google.com/drive/folders/14c4ykacvgoXNns1Gp92ACbfOTSQ4fhJ-?
usp=share_link

Zoom link

https://us02web.zoom.us/j/8015593116

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