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Applied and Numerical Analysis Seminar

Finite Element Complexes

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Abstract

A Hilbert complex consists of a sequence of Hilbert spaces interconnected by a series of closed, densely defined linear operators, such that the composition of two consecutive maps equals zero. The de Rham complex serves as the most prominent example. Finite element complexes arise from discretizing Hilbert complexes by substituting infinite dimensional Hilbert spaces with finite dimensional subspaces, based on a triangulation of the underline domain.

This presentation provides an overview of finite element complex construction, showcasing the finite element de Rham complex through a geometric decomposition method. The construction is extended to additional finite element complexes, such as the Hessian complex, elasticity complex, and divdiv complex, using the Bernstein-Gelfand-Gelfand (BGG) framework.

The resulting finite element complexes hold potential applications in numerical simulations for the biharmonic equation, linear elasticity, general relativity, and other geometry-related PDEs.

This work is a collaborative effort with Xuehai Huang from Shanghai University of Finance and Economics.

Date: 20 June 2023 (Tuesday)
Time: 3:00 pm – 4:00 pm (Hong Kong Time)
Venue: LSB 222

All are Welcome