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THE HONG KONG UNIVERSITY OF SCIENCE & TECHNOLOGY

Department of Mathematics

SEMINAR ON APPLIED MATHEMATICS

Mixed Finite Element Methods of Elasticity Problems

By

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Abstract

The problems that are most frequently solved in scientific and engineering computing may probably be the elasticity equations. The finite element method (FEM) was invented in analyzing the stress of the elastic structures in the 1950s. The mixed FEM within the Hellinger-Reissner (H-R) principle for elasticity yields a direct stress approximation since it takes both the stress and displacement as an independent variable. The mixed FEM can be free of locking for nearly incompressible materials, and be applied to plastic materials, and approximate both the equilibrium and traction boundary conditions more accurate. However, the symmetry of the stress plus the stability conditions make the design of the mixed FEM for elasticity surprisingly hard.

The talk presents a new framework to design and analyze the mixed FEM of elasticity problems, which yields optimal symmetric mixed FEMs. In addition, those elements are very easy to implement since their basis functions, based on those of the scalar Lagrange elements, can been explicitly written down by hand. The main ingredients of this framework are a structure of the discrete stress space on both simplicial and product grids, two basic algebraic results, and a two-step stability analysis method.

Date : 03 January, 2020 (Friday)
Time : 11:00am – 12:00noon
Venue : Room 3472, Academic Building (Lifts 25-26), HKUST

All are Welcome!