**Departmental Colloquia**

Department of Mathematics
香港城市大學
City University of Hong Kong

# DEPARTMENT OF MATHEMATICS

## City University of Hong Kong

# Raviart-Thomas enriched Scott-Vogelius finite element methods for the Navier-Stokes equations

**by**


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**Date: 18 Jan. 2022 (Wednesday)**
**Time: 4:00 – 5:00 pm**

## ABSTRACT


This talk concerns finite element methods for the incompressible Navier--Stokes problem. Structural properties of importance are the continuity requirement, the inf-sup stability and the divergence constraint, which are challenging to obtain simultaneously. Traditional finite element methods do not satisfy the divergence constraint exactly with the exception of the Scott--Vogelius finite element methods, i.e., P_k-P_{k-1} pairs, which are in general only stable on some special meshes such as barycentric refined meshes. The talk discusses a new approach which stabilizes the Scott--Vogelius elements by enriching the velocity space with some specially chosen Raviart--Thomas functions on arbitrary shape-regular meshes, such that the divergence-free property is maintained. Starting with the Stokes equations, the inf-sup stability, the convergence analysis and the pressure-robustness property of the newly proposed element is shown. Also a reduced version of the method with lower numerical costs, equivalent to a P_k-P_0 discretisation, is demonstrated. In the final part the new approach is extended to the Navier--Stokes problem, where also the convection-robustness property is of importance and suitable discretizations of the nonlinear term are discussed.


Register in advance for this talk:
https://cityu.zoom.us/meeting/register/tJ0uf-2trz4vHNycay6iwE3pvmLt2i8PoJ2W
*[Zoom link will be provided via email after registration.]*

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