


复旦大学数学科学学院
数学综合报告会

报告题目：Arbitrary Lagrangian–Eulerian Method for PDEs on Moving Domains

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报告摘要：

Partial differential equations on moving domains arise in many applications, including geometric evolution, fluid–structure interaction, and interfacial fluid dynamics. A widely used computational framework for such problems is the arbitrary Lagrangian–Eulerian finite element method (ALE-FEM), developed since the early 1980s. While ALE-FEM offers flexibility in handling mesh motion, it often suffers from mesh distortion over time, which can lead to numerical instability and even code breakdown, and poses challenges for the design of structure-preserving methods. In this talk, I will discuss recent developments in ALE-FEM with a focus on mesh quality and strategies to address its deterioration. One strategy involves the use of tangential velocities governed by auxiliary PDEs to redistribute mesh points dynamically. Another incorporates sliding interface techniques into the ALE framework to better accommodate rotating boundaries. I will also discuss structure-preserving schemes, with applications to fluid–structure interaction and free-boundary problems involving interfacial forces.

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