数学与系统科学研究院

计算数学所学术报告

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报告题目：

Numerical integration of homogeneous functions on convex and nonconvex polytopes: Applications in the extended finite element method

邀请人：　明平兵 研究员

报告时间：**2017** 年 **7** 月 **31** 日（周一）

下午 **16:00-17:00**

报告地点：　数学院南楼六层

602 教室

Abstract:

Accurate integration of polynomial functions over arbitrarily-shaped polygonal and polyhedral domains is required in methods such as the extended finite element method (X-FEM), embedded interface methods, virtual element method, and discontinuous and weak Galerkin methods, just to name a few. The most common approaches to perform this integration have been: tessellation of the domain into simplices; application of Stokes's theorem to reduce the volume integral to a surface integral; and use of moment-fitting methods to design suitable cubature rules.

In this talk, I will present a new approach that uses Stokes's theorem and the property of homogeneous functions, whereby it suffices to integrate such functions on the boundary facets of the polytope. For homogeneous polynomials, this approach is used to further reduce the integration to just evaluation of the function and its partial derivatives at the vertices of the polytope. This results in an exact cubature rule for a homogeneous polynomial. For weakly singular integrands in 2D, accurate and efficient numerical integration is realized. Numerical examples in two and three dimensions will be presented to demonstrate the efficacy of the integration scheme, and as applications we will consider elastic fracture in 2D and the modeling of holes with higher-order finite elements within the framework of the X-FEM. This is joint-work with Jean Lasserre (CNRS-LAAS, Institute of Mathematics, Toulouse) and Eric Chin (UC Davis).

欢迎大家参加！