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：

Challenges in Image-Based Geometric Modeling and Mesh Generation

邀请人：　　徐国良研究员

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计算数学所报告厅

Abstract:

With finite element method and scanning technology seeing increased use in active research areas such as biomechanics, there is an emerging need for high-fidelity geometric modeling and quality mesh generation of the spatially realistic domains that are being studied. In images obtained from various scanning techniques like CT/MRI, the domain of focus often possesses heterogeneous materials and/or functionally different properties. For each of the partitioned material regions, high fidelity geometric models and quality meshes are needed, with meshes conforming at the material boundaries. Although there have been tremendous progresses in the area of surface reconstruction and 3D geometric modeling, it still remains a challenge to generate desirable models for such complicated domains.

I will present challenges in this research area along with details of meshing pipelines, especially octree-based algorithms to extract adaptive and quality 2D (triangular or quadrilateral) and 3D (tetrahedral or hexahedral) meshes of volumetric domains, conforming to boundaries defined as level sets of a scalar function on the domain. Image processing, guaranteed-quality all-quadrilateral meshing, sharp feature preservation, and automatic meshing for multi-material domains will be discussed. Besides piecewise-linear element meshes, a skeleton-based sweeping method was developed to construct hexahedral solid NURBS for cardiovascular systems from imaging data, then a wavelets-based scheme is used to simplify and fair the NURBS surface with continuity preservation. Recently we also developed a novel method to convert any unstructured quadrilateral meshes to T-Spline surfaces. In this talk, I will additionally present several applications of our meshing schemes.

欢迎大家参加！