

数学与系统科学研究院

计算数学所学术报告

报告人: Associate Prof. Yongjie (Jessica) Zhang

( *Department of Mechanical Engineering, Carnegie Mellon University* )

报告题目:

**Image-Based Mesh Generation and  
Volumetric T-spline Construction**

邀请人: 徐国良 研究员

报告时间: 2013 年 4 月 28 日 (周日)

下午 15:00

报告地点: 科技综合楼三层 311

计算数学所报告厅

# **Abstract:**

With finite element method (FEM) 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. In this talk, I will highlight our research in this 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. Automatic mesh generation and robust quality improvement for complex domains with non-manifold boundaries, sharp feature preservation in all-hexahedral meshing for CAD assemblies, and guaranteed-quality mesh generation will be discussed.

In the second part of this talk, I will show our latest research on volumetric T-spline construction from boundary representations. For arbitrary topology objects, we first compute a smooth harmonic scalar field and saddle points are extracted to determine the topology. By dealing with the saddle points, a polycube whose topology is equivalent to the input geometry is built and it serves as the parametric domain for the trivariate T-spline. A polycube mapping is then used to build a one-to-one correspondence between the input surface and the polycube boundary. After that, we choose the deformed octree subdivision of the polycube as the initial T-mesh, and make it valid through pillowing, quality improvement and applying templates to handle extraordinary nodes. The obtained T-spline is  $C^2$ -continuous everywhere over the surface except for the local region surrounding polycube corner nodes.

## **Short Bio:**

Yongjie (Jessica) Zhang is an Associate Professor in Mechanical Engineering at Carnegie Mellon University with a courtesy appointment in Biomedical Engineering. She received her B.Eng. in Automotive Engineering, and M.Eng. in Engineering Mechanics, all from Tsinghua University, China, and M.Eng. in Aerospace Engineering and Engineering Mechanics, and Ph.D. in Computational Engineering and Sciences from the University of Texas at Austin. Her research interests include computational geometry, mesh generation, computer graphics, visualization, finite element method, isogeometric analysis and their application in computational biomedicine and engineering. She has co-authored over 90 publications in peer-reviewed international journals and conference proceedings. She is the recipient of NSF CAREER Award, Office of Naval Research Young Investigator Award, George Tallman Ladd Research Award, and Struminger Junior Faculty Fellowship.

Email: [jessicz@andrew.cmu.edu](mailto:jessicz@andrew.cmu.edu)

Homepage: <http://www.andrew.cmu.edu/~jessicz>

# 欢迎大家参加!