数学与系统科学研究院

计算数学所学术报告

报告人：　Prof. Chongmin Song

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报告题目：

The Scaled Boundary Finite Element Method: Towards Fully Automatic Computational Engineering Analysis

邀请人：　张晨松 副研究员

报告时间：2018 年 9 月 3 日（周一）

上午 10:30-11:30

报告地点：　科技综合楼三层

311 报告厅

Abstract:

The process of computational engineering analysis includes the discretization of geometric models and the solution of partial differential equations reformulated as a system of algebraic equations. In the popular finite element method, a geometric model is discretized into a mesh of elements of simple geometries (triangles and quadrilaterals in 2D, and tetrahedrons and hexahedrons in 3D). With increasingly affordable computer power, the human effort required in the mesh generation becomes more and more critical in terms of both cost and time, especially when moving boundaries or singularities are involved. At the meantime, the digital images and STL format are increasing popular in computer simulation, but most traditional mesh generation techniques for CAD models are not directly applicable.

This presentation covers the development of the scaled boundary finite element method and its application aiming to fully automate the process of computational engineering analysis. The scaled boundary finite elements are semi-analytical and particularly attractive in modelling problems with unbounded domains or singularities. The elements can have any number of faces, edges and vertices and require the discretization of boundary only, leading to a much higher degree of flexibility in mesh generation than standard finite elements. This allows the development of a polytope mesh generator based on the simple and efficient quatree/octree algorithm. Digital images, STL models and traditional CAD models can be handled in a unified approach. The whole analysis process is fully automatic. The efficiency, robustness and some salient features of the proposed technique will be demonstrated. Potential research and applications of this novel technique will be discussed.

Bio:

Dr. Chongmin Song is a Professor of Civil Engineering and Director of the Centre for Infrastructure Safety and Engineering, University of New South Wales, Sydney, Australia. He obtained the degree of Bachelor of Engineering from Tsinghua University, China and the degree of Doctor of Engineering from the University of Tokyo, Japan. His current research interests are on the development of advanced numerical methods and their application to civil engineering.

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