

Preface

As a new interdisciplinary research area, “image-based geometric modeling and mesh generation” integrates image processing, geometric modeling and mesh generation with finite element method (FEM) to solve problems in computational biomedicine, materials sciences and engineering. It is well known that FEM is currently well-developed and efficient, but mesh generation for complex geometries (e.g., the human body) still takes about 80% of the total analysis time and is the major obstacle to reduce the total computation time. It is mainly because none of the traditional approaches is sufficient to effectively construct finite element meshes for arbitrarily complicated domains, and generally a great deal of manual interaction is involved in mesh generation.

This contributed volume book, the first for such an interdisciplinary topic, collects the latest research of experts in this area. Of the fourteen invited book chapters, three of them were selected from high quality accepted papers in MeshMed, a workshop on mesh processing in medical image analysis in conjunction with the 14th International Conference on Medical Image Computing and Computer Assisted Intervention (MICCAI) 2011. These papers cover a broad range of topics, including medical imaging, image alignment and segmentation, image-to-mesh conversion, quality improvement, mesh warping, heterogeneous materials, biomolecular modeling and simulation, as well as medical and engineering applications.

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