

ROBUST AND FULLY AUTOMATIC TETRAHEDRAL MESH GENERATION

200 – ADVANCED DISCRETIZATION TECHNIQUES

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ABSTRACT

Robust and fully automatic tetrahedral mesh generation is an active area of research. While considered solved for small and clean geometries, there are many challenges to automatically mesh large, real-world models, including CAD assemblies, volume fraction and level set geometries. Challenges involve CAD feature capture, automatic defeaturing, dirty geometry, scalability, robustness, and ensuring minimal quality. Successfully tackling this challenge is paramount to design the next generation of black-box finite element analysis pipelines.

In this mini-symposium, we explore techniques for automatic tetrahedral mesh generation. Topics include, but are not limited to:

- HPC, shared memory and distributed memory algorithms for parallel mesh generation
- Automatic capture of geometric features for CAD geometry
- Automatic defeaturing for small or unimportant features
- User experience (UX) for driving automatic mesh generation including specification of key features and resolution control
- Strategies for guaranteeing resulting mesh quality
- Meshing for implicit interfaces defined via level sets or volume fractions
- Meshing for ill-defined geometries like triangle soup surface meshes or 3D voxel data
- Simultaneous meshing for CAD assemblies including handling gaps & overlaps
- Mesh transformations for improving mesh quality
- Automatic meshing of interior enclosures
- Integration of automatic meshing pipelines with finite element analysis frameworks

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