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**A feature-aware SPH for isotropic unstructured mesh generation.** (English) Zbl 07340459  
Comput. Methods Appl. Mech. Eng. 375, Article ID 113634, 26 p. (2021)

Summary: In this paper, we present a feature-aware SPH method for the concurrent and automated isotropic unstructured mesh generation. Two additional objectives are achieved with the proposed method compared to the original SPH-based mesh generator [the authors, “Parallel fast-neighbor-searching and communication strategy for particle-based methods”, Eng. Comput. 36, No. 3, 899–929 (2019; doi:10.1108/EC-05-2018-0226)]. First, a feature boundary correction term is introduced to address the issue of incomplete kernel support at the boundary vicinity. The mesh generation of feature curves, feature surfaces and volumes can be handled concurrently without explicitly following a dimensional sequence. Second, a two-phase model is proposed to characterize the mesh-generation procedure by a feature-size-adaptation phase and a mesh-quality-optimization phase. By proposing a new error measurement criterion and an adaptive control system with two sets of simulation parameters, the objectives of faster feature-size adaptation and local mesh-quality improvement are merged into a consistent framework. The proposed method is validated with a set of 2D and 3D numerical tests with different complexities and scales. The results demonstrate that high-quality meshes are generated with a significant speedup of convergence.

**MSC:**

76-XX Fluid mechanics

65-XX Numerical analysis

**Keywords:**

unstructured mesh; smoothing particle hydrodynamics; Delaunay triangulation; particle method

**Software:**

Netgen; CUDA; Intel TBB; CGALmesh; MersenneTwister; DualSPHysics; Triangle; TetGen

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