

Nonconforming Mesh Refinement for High-Order Finite Elements

Jakub Červený

Center for Applied Scientific Computing, Lawrence Livermore National Laboratory
cerveny1@llnl.gov

Tzanio Kolev, Veselin Dobrev, Robert Rieben

Lawrence Livermore National Laboratory
tzanio@llnl.gov, dobrev1@llnl.gov, rieben1@llnl.gov

Abstract

We are developing a general nonconforming mesh refinement capability in the MFEM finite element code. The goal is to support adaptive mesh refinement (AMR) on triangular, quadrilateral and hexahedral curvilinear meshes, at arbitrarily high order, for any finite element space. In this work we propose a data structure for meshes with hanging nodes and develop an algorithm to construct the AMR system through variational restriction. Our approach supports complex 3D anisotropic refinements, unlimited refinement levels of adjacent elements, and MPI parallelism with load balancing. We demonstrate the new algorithms on several shock hydrodynamic and electromagnetic problems.

References

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