

An adaptive multiscale finite volume solver for unsteady and steady state flow computations

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Abstract

In this paper we present the main conceptual ingredients and the current state of development of the new solver QUADFLOW for large scale simulations of compressible fluid flow and fluid–structure interaction. In order to keep the size of the discrete problems at every stage as small as possible, we employ a multiresolution adaptation strategy that will be described in the first part of the paper. In the second part we outline a new mesh generation concept that is to support the adaptive concepts as well as possible. A key idea is to understand meshes as parametric mappings determined by possibly few control points as opposed to store each mesh cell separately. Finally, we present a finite volume discretization which again is to support the adaptation concepts. We conclude with numerical examples of realistic applications demonstrating different features of the solver.

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