Block-structured Adaptive Mesh Refinement in C++

The AMROC Framework for Parallel AMR

Short course at INPE, 30th June to 1st July 2016

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Structure of the lectures

1. Structured adaptive mesh refinement
   ▶ Background and available SAMR software
   ▶ The recursive SAMR algorithm
   ▶ Overview of the AMROC software system
   ▶ Distributed memory parallelization
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2. Hyperbolic AMROC solvers
   ▶ Shock-capturing schemes for gas dynamics
   ▶ Higher-order discretizations
   ▶ Magneto-hydrodynamics
   ▶ Code snippets for interfacing with AMROC
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   - Code snippets for interfacing with AMROC

3. Discussion session
   - Demo of AMROC
   - Installation on student computers
   - Running examples, etc.
4. Complex hyperbolic SAMR applications
   - Consideration of non-Cartesian geometries
   - Shock-induced combustion simulation with AMROC
   - Fluid-structure interaction with the Virtual Test Facility
   - Compressible turbulence simulation
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5. Advanced topics
   ▶ Adaptive lattice Boltzmann methods with AMROC
   ▶ Large eddy simulation of subsonic problems
   ▶ Using SAMR for geometric multigrid methods
Useful references I

Finite volume methods for hyperbolic problems


Structured Adaptive Mesh Refinement


Useful references II


Lattice-Boltzmann methods


Adaptive multigrid (finite difference and finite element based in textbooks)


Useful references III


Implementation, parallelization


Applications (from my own work only)

Useful references IV


Useful references V
