Block-structured Adaptive Finite Volume Methods in C++

The AMROC Framework for Parallel AMR and Shock-Induced Combustion Simulation

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1. Fundamentals (18th)
   - Conservation laws
   - Finite volume methods
   - Upwind schemes

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3. Hyperbolic AMROC solvers (20th)
    - Higher-order methods
    - AMROC design
    - Clawpack and WENO solvers in AMROC

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4. Numerical methods for combustion research (20th)
   - Consideration of non-Cartesian geometries
   - Numerical methods for the inviscid reactive equations

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   - Extensions to viscous reactive equations

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   - Aerodynamics computations
8. Further topics and software demo of AMROC (22th)
   - Adaptive multigrid method
   - Installation of AMROC on Linux
   - Running examples

Useful references I

Finite volume methods for hyperbolic problems

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Structured Adaptive Mesh Refinement

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Useful references II

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Combustion, detonations and shockwave theory

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Shock-capturing schemes for combustion

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Lattice-Boltzmann methods

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

- Hackbusch, W. (1985). *Multi-Grid Methods and Applications*. Springer Verlag, Berlin, Heidelberg.

Useful references IV

- Briggs, W. L., Henson, V. E., and McCormick, S. F. (2001). *A Multigrid Tutorial*. Society for Industrial and Applied Mathematics, 2nd edition.
- Trottenberg, U., Oosterlee, C., and Schüller, A. (2001). *Multigrid*. Academic Press, San Antonio.
- Martin, D. F. (1998). *A cell-centered adaptive projection method for the incompressible Euler equations*. PhD thesis, University of California at Berkeley.

Fluid-structure interaction and further applications (from my own work only)

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- Deiterding, R., Radovitzky, R., Mauch, S. P., Noels, L., Cummings, J. C., and Meiron, D. I. (2006). A virtual test facility for the efficient simulation of solid materials under high energy shock-wave loading. *Engineering with Computers*, 22(3-4):325–347.
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Implementation, parallelization

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