Block-structured Adaptive Finite Volume Methods for Shock-Induced Combustion Simulation

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1. Fundamentals of finite volume methods
   - Shock-capturing schemes, higher-order methods
   - Discussion of mesh adaptation approaches

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5. Fluid-structure interaction (FSI) simulation
   - Examples of detonation-driven FSI
   - Adaptive Lattice-Boltzmann method

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8. Supplementary material
   - FV multigrid with SAMR codes

Useful references I

Finite volume methods for hyperbolic problems

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Structured Adaptive Mesh Refinement

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- Deiterding, R. (2011). Block-structured adaptive mesh refinement - theory, implementation and application, *Series in Applied and Industrial Mathematics: Proceedings*, 34: 97–150.

Combustion, detonations and shockwave theory

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- Ben-Dor, G. (2007). *Shock wave reflection phenomena*, Springer, Berlin.

Shock-capturing schemes for combustion

- Grossmann, B. and Cinella, P. (1990). Flux-split algorithms for flows with non-equilibrium chemistry and vibrational relaxation. *J. Comput. Phys.*, 88:131–168.
- Fedkiw, R. P., Merriman, B. and Osher, S. (1997). High accuracy numerical methods for thermally perfect gas flows with chemistry. *J. Comput. Phys.*, 132:175–190.
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Fluid-structure interaction and further applications (from my own work only)

- Deiterding, R. and Wood, S (2013). Parallel adaptive fluid-structure interaction simulation of explosions impacting on building structures. *Computers & Fluids*, 88: 719–729.
- 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.
- Pantano, C., Deiterding, R., Hill, D. J., and Pullin, D. I. (2007). A low-numerical dissipation patch-based adaptive mesh refinement method for large-eddy simulation of compressible flows. *J. Comput. Phys.*, 221(1):63–87.

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- Barton, P. T., Deiterding, R. and Meiron, D. I. and Pullin, D. I. (2013). Eulerian adaptive finite-difference method for high-velocity impact and penetration problems, *J. Comput. Phys.*, 240: 76–99.
- Perotti, L. E., Deiterding, R., Inaba, D, K., Shepherd, J. E. and Ortiz, M. (2013). Elastic response of water-filled fiber composite tubes under shock wave loading, *Int. J. Solids and Structures*, 50: 473–486.

Implementation, parallelization

- Hornung, R. D., Wissink, A. M., and Kohn, S. H. (2006). Managing complex data and geometry in parallel structured AMR applications. *Engineering with Computers*, 22:181–195.
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Useful references V

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

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