**Central schemes for hyperbolic systems and applications**

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We present an unstaggered, non-oscillatory, second-order accurate central scheme for the numerical solution of hyperbolic systems of conservation laws in one and two space dimensions. The proposed scheme evolves a piecewise linear numerical solution on a unique grid and avoids the resolution of the Riemann problems arising at the cell interfaces thanks to a layer of ghost staggered cells intermediately used while updating the numerical solution. The numerical scheme is then applied and classical shallow water equation problems are solved. To ensure the steady state (equilibrium state) requirement, a well-balanced discretization of the fluxes and source term is developed and the surface gradient method is extended for the forward and backward spatial projection steps. The resulting adaptation of the central scheme is a well-balanced unstaggered central scheme that ensures the lake at rest requirement of the shallow water equations.

As a second application of the unstaggered central scheme, we consider the system of ideal magnetohydrodynamic equations (MHD). In order to satisfy the divergence-free constraint of the magnetic field in the numerical solution of the MHD system, we adapt Evans and Hawley's constrained transport method to the case of unstaggered central schemes and use it to correct the magnetic field/flux components at the end of each time step. The resulting scheme is then applied and classical MHD problems are successfully solved.