FINITE VOLUME/DG SCHEMES BASED ON CONSTRAINED MINIMIZATION FUNCTION RECOVERY

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Abstract. Traditional finite volume discretizations of time dependent PDEs allow for straightforward computation of averaged (piecewise constant) values of the physical quantities involved (such as pressure, velocity, density and energy). However, in order to close the overall discretization scheme, certain derivatives (gradient or divergence) of some of these quantities are needed. On the example of the Euler equations of gas dynamics, we study an approach based on minimizing TV (total variation) functionals subject to equality and inequality constraints to construct smooth function recovery of the pressure and velocity from their average values. The constraints have physical meaning; namely, positivity of pressure (or internal energy) and the recovered functions to preserve (approximately) their averages computed by the finite volume scheme. Extensions to higher order DG (discontinuous Galerkin) schemes can be derived in the same manner. We illustrate the overall finite volume scheme with some preliminary numerical results.

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